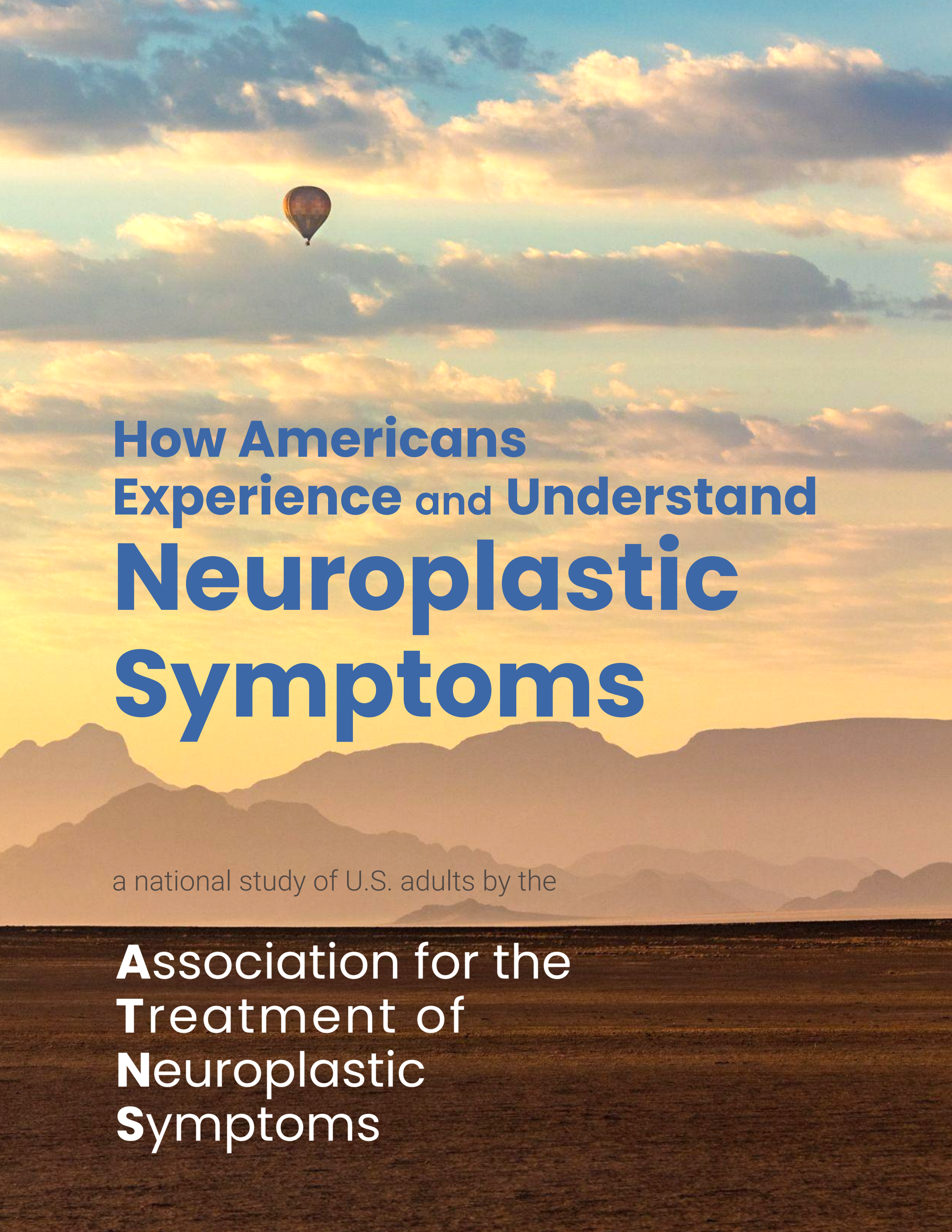

How Americans Experience and Understand Neuroplastic Symptoms

a national study of U.S. adults by the

Association for the
Treatment of
Neuroplastic
Symptoms

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About ATNS

The Association for the Treatment of Neuroplastic Symptoms is a 501(c)(3) nonprofit organization with a mission to educate the public, patients, and practitioners about how to diagnose and treat neuroplastic pain and illness. Founded in 2011 and led by volunteer medical and mental health practitioners, researchers and patient advocates, ATNS provides the information and tools needed to recognize and treat neuroplastic conditions; explains and promotes the latest scientific research; advocates for healthcare policies that support access to quality treatment; and empowers people to advance their own healing.

Citation and Use

This report and the data it presents may be cited as:

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Executive Summary

Until recently, little could be done for the tens of millions of Americans with pain or illness that is not linked to structural damage or disease (neuroplastic symptoms; NS). Now that has changed. Clinical trials have achieved remarkable results using new *neuroplastic recovery therapies* (NRT). This has generated strong interest in how people experience and understand NS and the barriers that limit their successful treatment. To learn more, we conducted a nationally representative survey of 1,516 American adults.

In this report, we review common types of NS, their prevalence, and the remarkable outcomes found in clinical trials of NRTs. Then we argue social science research is essential for the design and implementation of a public health education plan for NS. We then report our findings and interpretations for how the findings could be applied to the goal of enabling as many patients as possible to receive the benefit of NRT. Key findings include:

- **Psychological Factors:** A large majority of Americans believe symptoms like fatigue, back or neck pain, and headaches can be caused by psychological factors at least "Some of the time." [p. 13] Fewer than 1 in 3 Americans say psychological causes are "Rarely" or "Never" a significant contributor to these symptoms. [p. 13]
- **Social Network:** 51% of American adults know at least one person in their close network who has ongoing pain or illness *with no clear diagnosis*. [p. 15]
- **Psychological Treatment:** About half of Americans say psychological treatments would be at least "Somewhat" effective for headaches (54%) and fatigue (52%), but far fewer think the same for other types of symptoms. However, one of the most common responses to these questions (23-43%) is "Don't know enough to say." [p. 16]
- **Information Sources:** Healthcare professionals are the most widely trusted source of information about neuroplastic conditions but *the second most trusted* source is people who have recovered from their own ongoing pain or illness. [p. 17]

One challenge for this research is that very few people are given a diagnosis of NS directly. Thus, we used a combination of measures to identify a subset of our national sample who are most likely to have NS. These are people who a) have symptoms with no definite explanation or b) have been given an explanation but have not been responding to treatment as their medical clinician expects. We refer to this as our **"target subgroup"** and it represents the segment of the U.S. population **who have a high likelihood of having neuroplastic symptoms**. A special section of the survey was devoted to this subgroup. Key findings include:

- **Symptom Frequency:** Their most common symptoms are pain in the back or neck (65%) and pain in muscles, limbs, or joints (57%). However, a large portion (43%) also report chronic fatigue and many (35%) have headaches or migraines. [p. 19]
- **Gender Differences:** Women in this target subgroup are more likely than men to suffer from fatigue (by 12 percentage points), headaches or migraines (15 points), digestive or bowel problems (9 points), and dizziness (10 points). [p. 19]
- **Number of Symptoms:** Most in the target subgroup have multiple types of symptoms: 29% reported only one type, 41% reported two or three types, and the remaining 29% reported four or more symptom types (average = 2.8). [p. 20]
- **Symptom Co-Occurrence:** Dizziness, fatigue, and digestive or bowel problems were what co-occurred most often with other symptoms. [p. 21]
- **Symptom Duration:** 63% have been experiencing their current symptoms for up to five years while 37% have had them for more than five years. [p. 22]
- **Perceived Symptom Cause:** When asked what the primary cause of their symptoms is, 37% of the target group chose injury to bones, joints, or muscles. However, a remarkable 30% chose psychological factors ("stress, trauma, emotions, or life challenges"), 17% said "No clear cause" and 10% stated "I have not seen a medical professional." In total, *57% of the target subgroup lack a diagnosis that points to a clear physical cause* of their symptoms. [p. 23]
- **Perceived Psychological Cause:** People were extremely more likely to report that a symptom could have a psychological cause at least some of the time if they had the symptoms themselves (76-97%). [p. 25]
- **Effectiveness of Psychotherapy:** However, awareness of potential psychological causes does not always correspond to belief in the value of psychological treatments. About 58% of the target subgroup *both* thinks a symptom they themselves have is at least "Sometimes" caused by psychological causes *and also* thinks that psychological treatments for that same symptom would be *less than* "Somewhat" effective. [p. 27-28]
- **Acceptance of Psychotherapy:** Within the target subgroup, 47% are either "definitely" or "probably" willing to try neuroplastic psychological treatment. Only 20% say they likely would not. [p. 28]
- **Barriers to Treatment:** Only 24% think accessing neuroplastic treatments would be easy. Two key barriers were financial: the perception that they cost too much (82%) or would not be covered by insurance (68%). Other key barriers were a lack of information (79%) and a lack of belief in effectiveness (66%). [p. 31]

Further analyses from this rich dataset will be published as a series of articles here on the ATNS website. For more resources and to learn more, visit www.symptomatic.me/survey.

Introduction

Tens of millions of Americans are suffering unnecessarily from *neuroplastic symptoms* (NS).[1,2] These symptoms consist of chronic pain or illness caused not by injury or disease but rather by changes in nerve pathways in the brain.[3] These altered circuits are linked to stress, trauma, emotions, the long-term impact of Adverse Childhood Experiences,[4] and other life challenges that can happen to anyone.

Symptoms that are neuroplastic include but are not limited to:

- Chronic pain in the spine, muscles, limbs, or joints, including fibromyalgia
- Chronic pain in the chest, abdomen, pelvis, bladder, or genitals
- Fatigue including many cases of chronic fatigue syndrome
- Digestive problems such as irritable bowel syndrome
- Headache or migraine
- Dizziness
- Visual disturbances and functional neurologic disorders
- Long COVID

The Prevalence of Neuroplastic Symptoms

Previous research has documented a high prevalence of conditions likely to be neuroplastic. For example, a recent survey found that 24% of American adults suffer from chronic pain.[5] While for some of them, the pain is due to organ disease or structural damage, a recent study of people with chronic spine pain found that in an astounding 88% the cause was neuroplastic.[6]

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[1] Haller, H., Cramer, H., Lauche, R., & Dobos, G. (2015). Somatoform disorders and medically unexplained symptoms in primary care: a systematic review and meta-analysis of prevalence. *Deutsches Ärzteblatt International, 112*(16), 279.

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[4] Bussières, A., Hancock, M. J., Elklit, A., Ferreira, M. L., Ferreira, P. H., Stone, L. S., ... & Hartvigsen, J. (2023). Adverse childhood experience is associated with an increased risk of reporting chronic pain in adulthood: a systematic review and meta-analysis. *European Journal of Psychotraumatology, 14*(2). DOI: 10.1080/20008066. 2023.2284025

[5] Zajacova, A., Grol-Prokopczyk, H., & Nahin, R. L. (2022). Pain among US adults before, during, and after the COVID-19 pandemic: a study using the 2019 to 2023 National Health Interview Survey. *Pain*, 10-1097. DOI: 10.1097/j.pain.0000000000003764

[6] Schubiner, H., Lowry, W. J., Heule, M., Ashar, Y. K., Lim, M., Mekaru, S., ... & Lumley, M. A. (2024). Application of a clinical approach to diagnosing primary pain: prevalence and correlates of primary back and neck pain in a community physiatry clinic. *The Journal of Pain, 25*(3), 672-681. DOI: 10.1016/j.jpain.2023.09.019

In addition, studies have documented co-occurrence of several neuroplastic conditions that include irritable bowel syndrome (IBS), fibromyalgia (FM), chronic fatigue syndrome (CFS) / myalgic encephalomyelitis (ME), and migraine. These conditions are increasingly seen as having overlapping symptoms and possibly shared pathophysiological mechanisms.

For example, in a large-scale study analyzing over 1.2 million IBS patient hospitalizations,[7] 11% also had fibromyalgia and 0.42% had chronic fatigue syndrome. These incidence rates represent a five-fold higher prevalence of FM and CFS than in the general population. Conversely, other studies have found that up to 92% of CFS patients and 77% of FM patients meet the criteria for IBS, compared to only 18% in control groups.[8]

Migraines are also linked to other neuroplastic conditions. One meta-analysis found that people with migraine were about 2.5 times more likely to have IBS, while those with IBS were about twice as likely to have migraines compared to the general population.[9] The risk of developing CFS is about 1.5 times higher in people with migraines. Conversely, headaches (often migraines) have been reported in up to 59% of people with CFS.[10] Finally, the incidence of migraine was twice as high in a fibromyalgia cohort than in the corresponding control cohort (hazard ratio = 2.1), and the incidence of fibromyalgia in the migraine cohort was 1.6 times greater than that in the corresponding control cohort.[11]

There are many factors—often shared causes—that might account for these overlaps. For example, although not part of our current survey, adverse childhood experiences (ACEs) are a common factor in neuroplastic symptoms. The prevalence of chronic pain in adults rises linearly with the number of ACEs.[4] In IBS, 63% of patients report exposure to at least one ACE, with emotional abuse being most prevalent (35%), followed by physical abuse (28%),

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[7] Tarar, Z. I., Farooq, U., Nawaz, A., Gandhi, M., Ghouri, Y. A., Bhatt, A., & Cash, B. D. (2023). Prevalence of Fibromyalgia and chronic fatigue syndrome among individuals with irritable bowel syndrome: an analysis of United States national inpatient sample database. *Biomedicines, 11*(10), 2594. DOI:10.3390/biomedicines11092389

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[10] Kumar, H., Dhamija, K., Duggal, A., Khwaja, G. A., & Roshan, S. (2023). Fatigue, chronic fatigue syndrome and migraine: intersecting the lines through a cross-sectional study in patients with episodic and chronic migraine. *Journal of Neurosciences in Rural Practice, 14*(3), 424. DOI: 10.25259/JNRP_63_2022.

[11] Penn, I. W., Chuang, E., Chuang, T. Y., Lin, C. L., & Kao, C. H. (2019). Bidirectional association between migraine and fibromyalgia: retrospective cohort analyses of two populations. *BMJ Open, 9*(4), e026581.

and emotional neglect (28%).[12] The severity of IBS symptoms and abdominal pain is positively correlated with total ACE scores.[13]

In CFS, exposure to childhood trauma is associated with a six-fold increased risk. Sexual abuse, emotional abuse, and emotional neglect most distinguish CFS cases from controls, with a graded relationship between exposure level and CFS risk.[14] In another study, exposure to childhood trauma was associated with a 3- to 8-fold increased risk for CFS across different trauma types.[15] There was a graded relationship between the degree of trauma exposure and CFS risk. Childhood trauma was associated with greater CFS symptom severity and with symptoms of depression, anxiety, and posttraumatic stress disorder.

Among headache disorders (including migraine), one study found that experiencing at least one traumatic event in childhood increases the risk by approximately 48% compared to those without ACEs.[16] Individuals with four or more ACEs had more than triple the odds of developing migraine compared to those with none. In fibromyalgia, both physical and sexual abuse during childhood are risk factors,[17] with emotional abuse, physical abuse, and physical neglect all positively correlated with symptom severity.[18]

Treatments for Neuroplastic Symptoms

These conditions are frustrating for patients and their clinicians because of the lack of a clear physical cause and the limited benefit of treatment that is focused on physical symptoms. Billions of dollars are spent on diagnostic tests for these patients, and more billions on prescription medication, manual treatments, injections, nerve blocks, implanted

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[12] Alsubaie, M. A., Alkhalifah, H. A., Ali, A. H., Bahabri, M. A., Alharbi, B. A., Alfakeh, S. A., ... & Alfakeh, S. (2022). Adverse childhood experiences and their effect on irritable bowel syndrome among Saudi Arabian adults. *Cureus, 14*(6). DOI: 10.7759/cureus.25791.

[13] Park, S. H., Videlock, E. J., Shih, W., Presson, A. P., Mayer, E. A., & Chang, L. (2016). Adverse childhood experiences are associated with irritable bowel syndrome and gastrointestinal symptom severity. *Neurogastroenterology & Motility, 28*(8), 1252-1260. DOI: 10.1111/nmo.12826.

[14] Heim, C., Nater, U. M., Maloney, E., Boneva, R., Jones, J. F., & Reeves, W. C. (2009). Childhood trauma and risk for chronic fatigue syndrome: association with neuroendocrine dysfunction. *Archives of General Psychiatry, 66*(1), 72-80. DOI: 10.1001/archgenpsychiatry.2008.508.

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[16] Siego, C. V., Sanchez, S. E., Jimenez, M. L., Rondon, M. B., Williams, M. A., Peterlin, B. L., & Gelaye, B. (2021). Associations between adverse childhood experiences and migraine among teenage mothers in Peru. *Journal of Psychosomatic Research, 147,* 110507. DOI: 10.1016/j.jpsychores.2021.110507.

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[18] Kızılkurt, Ö. K., Demirkan, A. K., Gıynaş, F. E., & Güleç, H. (2021). Effect of childhood trauma on disease severity in patients with fibromyalgia: The mediating role of psychological resilience. *Archives of Rheumatology, 36*(4), 538.

devices, surgery, supplements, and quasi-medical devices.[19,20] It is common for these treatments to offer nothing more than placebo value for neuroplastic conditions.[21]

Fortunately, several recent studies have documented significant improvement in symptoms from new forms of psychotherapy that we refer to collectively as *neuroplastic recovery therapies* (NRT).[22,23,24,25,26,27] For example, in the Boulder Back Pain study[21] subjects with back pain for an average of ten years experienced an average of 75% improvement in pain after eight sessions of *pain reprocessing therapy* (PRT). This was sustained for the full year of the study and led to far better improvement than either of the two control groups. The core approach of PRT is alleviating patients' fear that their body is damaged and shifting their attention to life issues that are affecting the brain.

In a UCLA/VA study[24] another neuroplastic recovery therapy called Emotional Awareness and Expression Therapy (EAET) was compared to standard Cognitive Behavioral Therapy (CBT) in a group of older male veterans (mean age = 72) with chronic musculoskeletal pain. EAET emphasizes developing conscious recognition of repressed emotions and then expressing them in written or spoken words. The goal was to achieve at least 30% pain relief, which was achieved in 63% of the EAET group but only in 17% of the CBT group.

Despite these demonstrated successes, neuroplastic recovery therapies are not yet widely used. To increase our understanding of the prevalence of different kinds of neuroplastic

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[19] Barsky, A. J., Orav, E. J., & Bates, D. W. (2005). Somatization increases medical utilization and costs independent of psychiatric and medical comorbidity. *Archives of General Psychiatry, 62,* 903–910. DOI: 10.1001/archpsyc. 62.8.903

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[21] Deyo, R. A., Mirza, S. K., Turner, J. A., & Martin, B. I. (2009). Overtreating chronic back pain: time to back off?. *The Journal of the American Board of Family Medicine, 22*(1), 62-68.

[22] Ashar YK, Gordon A, Schubiner H et al (2021). Effect of Pain Reprocessing Therapy vs Placebo and Usual Care for Patients with Chronic Back Pain. A Randomized Clinical Trial. *JAMA Psychiatry.* DOI: 10.1001/jamapsychiatry.2021.2669

[23] Donnino, M. W., Thompson, G. S., Mehta, S., Paschali, M., Howard, P., Antonsen, S. B., ... & Grossestreuer, A. V. (2021). Psychophysiologic symptom relief therapy for chronic back pain: a pilot randomized controlled trial. *Pain Reports, 6*(3), e959. DOI: 10.1097/PR9.0000000000000959

[24] Donnino, M., Howard, P., Mehta, S., Silverman, J., Cabrera, M. J., Yamin, J. B., ... & Grossestreuer, A. V. (2023). Psychophysiologic symptom relief therapy for post-acute sequelae of coronavirus disease 2019. *Mayo Clinic Proceedings: Innovations, Quality & Outcomes, 7*(4), 337-348. DOI: 10.1016/j.mayocpiqo.2023.05.002

[25] Yarns, B. C., Jackson, N. J., Alas, A., Melrose, R. J., Lumley, M. A., & Sultzer, D. L. (2024). Emotional awareness and expression therapy vs cognitive behavioral therapy for chronic pain in older veterans: a randomized clinical trial. *JAMA Network Open, 7*(6), e2415842 - e2415842. DOI: 10.1001/jamanetworkopen.2024.15842

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[27] Abbass, A., Campbell, S., Magee, K., Tarzwell, R. (2009). Intensive short-term dynamic psychotherapy to reduce rates of emergency department return visits for patients with medically unexplained symptoms: preliminary evidence from a pre-post intervention study. *Canadian Journal of Emergency Medicine, 11*(6), 529-34.

symptoms, what people understand about them, and their beliefs about potential treatments, we conducted a nationally representative study of US adults. In this study, we also examined how key subgroups of Americans differ on each of these dimensions. This research is fundamental to expanding public awareness and understanding that there are highly effective new forms of treatment. It also is essential for identifying high-impact public communication opportunities.

Goals of Our National Study

The Case for Social Science Research

The present study is motivated by the principle that *what people think* about neuroplastic symptoms and NRTs is a core determinant of whether they are likely to be successfully treated. This is supported by the large body of research on behavior change that shows the importance of public perception in the process of influencing health behaviors and conducting successful public health campaigns.[28,29,30] Although there are many ways to conceptualize or model the process of behavior change, a few key factors consistently rise to the surface as being important across theories, research methods, and topic areas: attitudes, social norms, and self-efficacy.[31]

Attitudes comprise people's thoughts or feelings about something (i.e., an "attitude object"). In our current study context, this includes what people think about the various potential causes of symptoms and how effective various treatment options are. There are many different dimensions to these attitudes, which form an interconnected network or belief system.[32] In the case of neuroplastic symptoms, it is important to understand people's basic attitudes about whether psychological factors can cause symptoms like back pain, headaches, chronic fatigue, and other symptoms detailed above. We mark this as a

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[28] Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes, 50,* 179–211.
[29] Conner, M., & Armitage, C. J. (1998). Extending the Theory of Planned Behavior: A Review and Avenues for Further Research. *Journal of Applied Social Psychology, 28*(15), 1429–1464. DOI: 10.1111/j.1559-1816.1998.tb01685.x
[30] Prochaska, J. O., & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion, 12*(1), 38-48.
[31] Sheeran, P., Maki, A., Montanaro, E., Avishai-Yitshak, A., Bryan, A., Klein, W. M. P., Miles, E., & Rothman, A. J. (2016). The impact of changing attitudes, norms, and self-efficacy on health-related intentions and behavior: A meta-analysis. *Health Psychology, 35*(11), 1178–1188. DOI: 10.1037/hea0000387
[32] Dalege, J., Borsboom, D., van Harreveld, F., van den Berg, H., Conner, M., & van der Maas, H. L. J. (2016). Toward a formalized account of attitudes: The Causal Attitude Network (CAN) model. *Psychological Review, 123*(1), 2–22. DOI: 10.1037/a0039802

fundamental starting point because if people don't believe that their symptoms could have psychological causes, they would be unlikely to try psychological treatments.
It is also important to understand whether people think psychological approaches such as NRT could be effective for *treating* physical symptoms, and whether this differs across types of symptoms. By discovering which symptoms are more or less commonly perceived as treatable with psychological approaches, we can uncover the most productive strategies and target audiences for communication campaigns and public education.

Social norms are another essential element of widespread behavior change.[27,33] Social norms are what are perceived to be the "normative" or usual beliefs, behaviors, preferences, and values of others in a social group.[34] The norms of a group or society are influential due to the strong pressure to conform to what is typical or expected in that group. As such, these norms could either constitute a barrier to the desired change (if most people oppose it) or a catalyst (if most people support it). A large body of research supports that idea that increasing perceptions of a social norm leads to changes in behavior.[30,32]

For our particular study, an important element of the social norm is whether others in people's close social relationships are experiencing symptoms that are likely to be neuroplastic. This is especially important because of the existing stigma towards people suffering from chronic pain with sources in the general public, healthcare professionals, and internally by the patients themselves.[35,36] Understanding social norms also has significant strategic value if successfully treating people's neuroplastic symptoms could increase the chances that they encourage others to try neuroplastic recovery therapies. This would lead to greater total impact of public communication efforts to encourage people to try treatment options that are likely to be effective for them due to greater reach.[37]

A third essential element in behavior change is self-efficacy. Put simply, self-efficacy refers to people's beliefs about whether or not they can do something. Applied to the present study, a central facet of this is whether people think they have the ability to find and access

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[33] Bergquist, M., Thiel, M., Goldberg, M. H., & van der Linden, S. (2023). Field interventions for climate change mitigation behaviors: A second-order meta-analysis. *Proceedings of the National Academy of Sciences, 120*(13), e2214851120. DOI: 10.1073/pnas.2214851120

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[36] Thapa, R., & Ang, D. (2025). Nociplastic pain: A practical guide to chronic pain management in the primary care setting. *Cleveland Clinic Journal of Medicine, 92*(4), 236-247. DOI: 10.3949/ccjm.92a.24101

[37] Goldberg, M. H., & Gustafson, A. (2023). A Framework for Understanding the Effects of Strategic Communication Campaigns. *International Journal of Strategic Communication, 17*(1), 1–20. DOI: 10.1080/1553118X.2022.2137674

resources or practitioners that would provide them with neuroplastic recovery therapies. Even when people have a positive attitude towards a treatment option and there is social support for trying it, low self-efficacy could still be an obstacle that prevents behavior change.[30]

To further increase the value of this research, it is essential to understand how different audiences in the US differ in the prevalence of symptoms and their willingness to try neuroplastic recovery therapies. These insights can help increase the overall effectiveness of public communication campaigns by targeting communications to audiences that have a higher probability of responding positively.[36,38]

Target Outcomes

Our long-term vision is to dramatically increase the understanding and treatment of neuroplastic symptoms among the public, patients, and practitioners. In service of that vision, we aim to generate social insights that patients, public communicators, practitioners, and others can apply to more effectively engage with people who are suffering from neuroplastic conditions and get them the effective treatment options they need.

Drawing on the literature detailed above, we set out to answer a series of questions that will deepen our understanding of people's perceptions of and experiences with neuroplastic symptoms. First, we sought to understand the extent to which people believe certain symptoms (e.g., back pain, migraine, chronic fatigue, etc.) could have psychological causes. Then we examined the extent to which people believe that psychological treatments could be effective for a wide array of symptoms. Because our focus is on using the insights from this study to inform the design of effective public communication campaigns, we also asked people who they trust for information about this topic.

Going beyond prior studies, we aimed to measure the prevalence of neuroplastic symptoms based on a broader definition that relied on a combination of 1) whether one has ongoing pain or illness, 2) if so, whether it has a clear explanation, and 3) whether one's symptoms are responding to treatment as their doctor expects. More specific criteria are detailed in the next section. Further, given the importance of social norms and communication in close relationships, another important target outcome of this study was to understand the

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[38] Metcalf, A. L., Angle, J. W., Phelan, C. N., Muth, B. A., & Finley, J. C. (2019). More "Bank" for the Buck: Microtargeting and Normative Appeals to Increase Social Marketing Efficiency. *Social Marketing Quarterly, 25*(1), 26–39. DOI: 10.1177/1524500418818063

prevalence of people knowing others in their close social network who might be experiencing neuroplastic symptoms.

Additionally, among the subgroup of people we identified as likely to have neuroplastic symptoms, our goal was to understand the prevalence of different kinds of symptoms, how the symptoms relate to one another, how long people have been experiencing such symptoms, and how subgroups of the population differ in their patterns and prevalence of symptoms. Another target outcome was to understand people's diagnoses they have received from medical professionals, related to but not the same as their specific symptoms.

We also had target outcomes that more directly focused on opportunities for strategic communication efforts to connect people with information that would be helpful to treating their neuroplastic symptoms. Our goal was to understand people's willingness to try neuroplastic recovery therapies, people's perceptions of how difficult or easy it would be to find resources or practitioners that would help them with their recovery, and finally, the barriers people perceive to be affecting their likelihood of trying neuroplastic treatments.

Study Overview

Data Collection

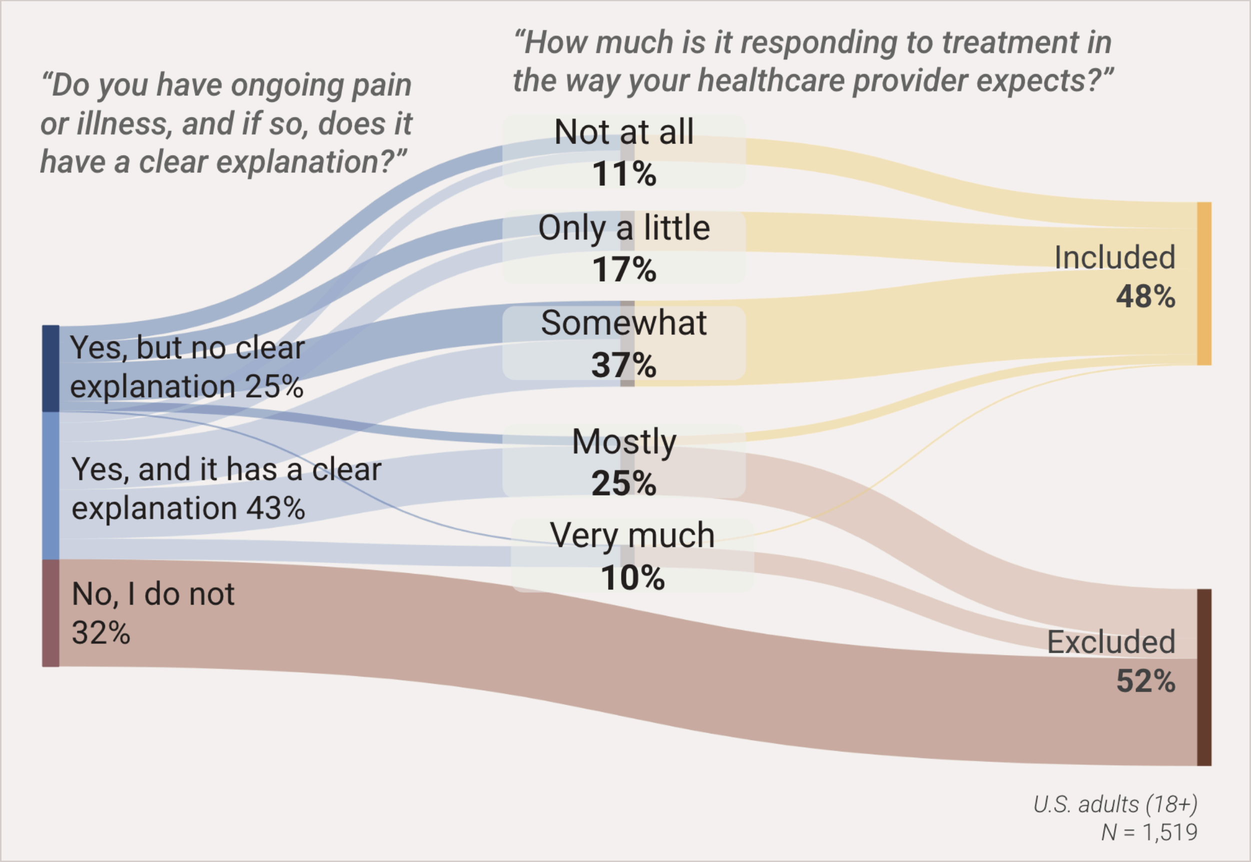
To answer these questions, in May of 2025 we conducted a nationally representative survey of American adults. To study this population, we partnered with XandY to collect a sample (*N* = 1,516) that mirrored U.S. Census proportions of age, gender, income, education, race and ethnicity, and geographic region. Internal estimates were also used to set sampling quotas for political party affiliation. After data cleaning and statistical weighting, our findings can be considered representative of U.S. adults with an average margin of error of +/- 3 percentage points.

The participants in our study completed a survey that asked them about their experience with ongoing pain or illness (if any), as well as their perceptions of neuroplastic symptoms and treatments. The full methodological details of this study are provided later in the Extended Methods section.

The Target Subgroup

In this study, one of our primary goals was to generate insights about the national adult population in the U.S. But another primary goal was to study the beliefs, attitudes, and behavioral intentions of Americans who are most likely to have neuroplastic symptoms. However, many people with neuroplastic symptoms may not know it, often due to lack of awareness that this is even a possibility. Therefore, we developed survey items that could be used to identify the group of people within the full national sample with the highest likelihood of having neuroplastic symptoms, even if they do not recognize it by that name.

Figure 1: The target subgroup was created by filtering to those who are most likely to have neuroplastic conditions.



U.S. adults (18+)
N = 1,519

To create this "target subgroup" of people with high likelihood of neuroplastic symptoms, we used a filtering process with two individual survey questions (see Figure 1). The first question asked *"Do you have ongoing pain or illness and, if so, does it have a clear explanation?"* and the second question asked *"How much is your ongoing pain or illness responding to* *treatment in the way that your healthcare provider expects it should?"* As shown in Figure 1, participants included in the target subgroup if either a) they said they do have ongoing pain or illness but it has no clear explanation, or b) if they have ongoing pain or illness that *does* have a clear explanation, but it has been responding to treatment only "Somewhat" or less well compared to expectations.

Overall, 48% of the national sample was included in the target subgroup (*n* = 757). This is intentionally casting a broad net, such that an unknown portion of the target subgroup has symptoms that are not neuroplastic. That is, a person may have ongoing pain from arthritis ("Yes, and it has a clear explanation") but if it is responding to treatment "Not at all" as expected, then they could still end up in our target subgroup. We decided that we would rather include some people without neuroplastic symptoms rather than use more stringent criteria and thereby risk excluding some people *with* neuroplastic symptoms. For example, nearly half (47%) of those included in our target subgroup are people who said their ongoing pain or illness *does* have a clear explanation. Rather than presume that all of those cases all have a clear physical cause, we chose to include them in the target subgroup. This is because many people with neuroplastic symptoms have either been misdiagnosed or have a combination of symptoms with a variety of causes.

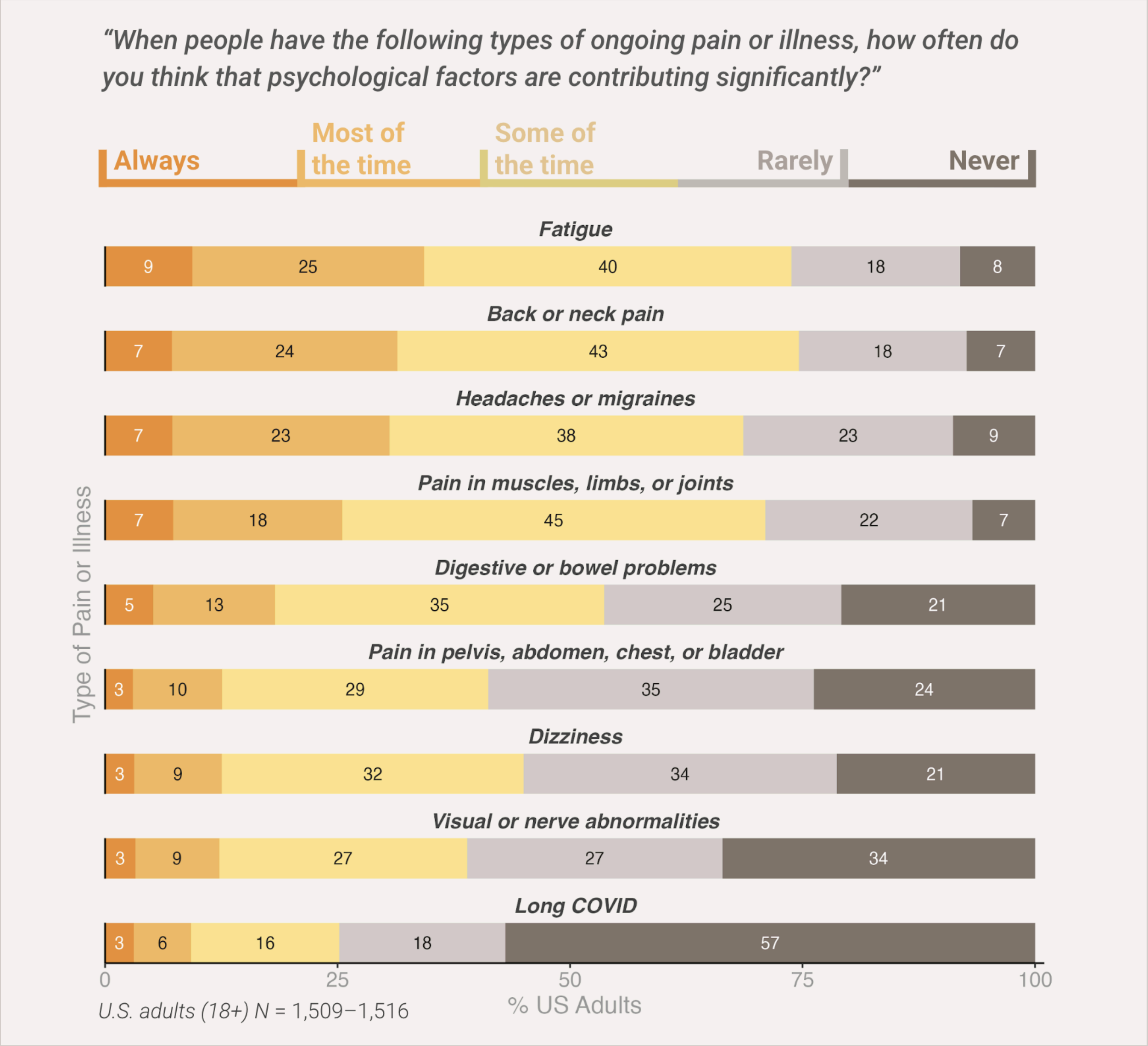
In sum, we do not presume that this target subgroup is precisely identifying Americans who have neuroplastic symptoms. Instead, this group represents those who have a *high likelihood* of neuroplastic symptoms, due to the fact that they a) have ongoing pain or illness, and b) it either is not responding as expected to treatment or does not have a clear explanation.

Results and Applications

Perceptions of Neuroplastic Symptoms and Treatments

The findings from our national survey reveal many important insights about how Americans view neuroplastic symptoms and treatments. In the full national sample, our data (Figure 2 below) show that a majority of Americans think that symptoms like fatigue, back or neck pain, and headaches can be caused by psychological factors at least "some of the time." It is far less common for people to consider psychological causes to be likely for symptoms like dizziness or visual and nerve abnormalities.

Figure 2: Many see psychological causes as possible for some conditions.



In Figure 2 above, it is tempting to focus only on the amount of people who say "Always" or "Most of the time" since these represent the people who are most aware of the potential for psychological causes. However, it is also valuable to consider the other side of the spectrum. Our results show that—for several of these symptoms—*very few people* (less than 1 in 3 Americans) say psychological causes are "Rarely" or "Never" a significant contributor. This is strong evidence that in the mind of the American public there is not much opposition to the basic idea of neuroplastic symptoms. Overall, this shows a favorable climate for progress, as most people do not need to be persuaded to change deeply held beliefs.

An important avenue for future research is to explore what the general population thinks about the potential for psychological causes *specifically when no physical cause has been found*. Our findings shown in Figure 2 may be a lower bound for the public's openness to the possibility of psychological causes, and this openness may increase substantially in situations where physical causes have been determined to be an unsatisfactory explanation. An important goal for progress on this issue is to spread awareness of the fact that a lack of a physical explanation is a very strong indicator of the symptoms being neuroplastic.

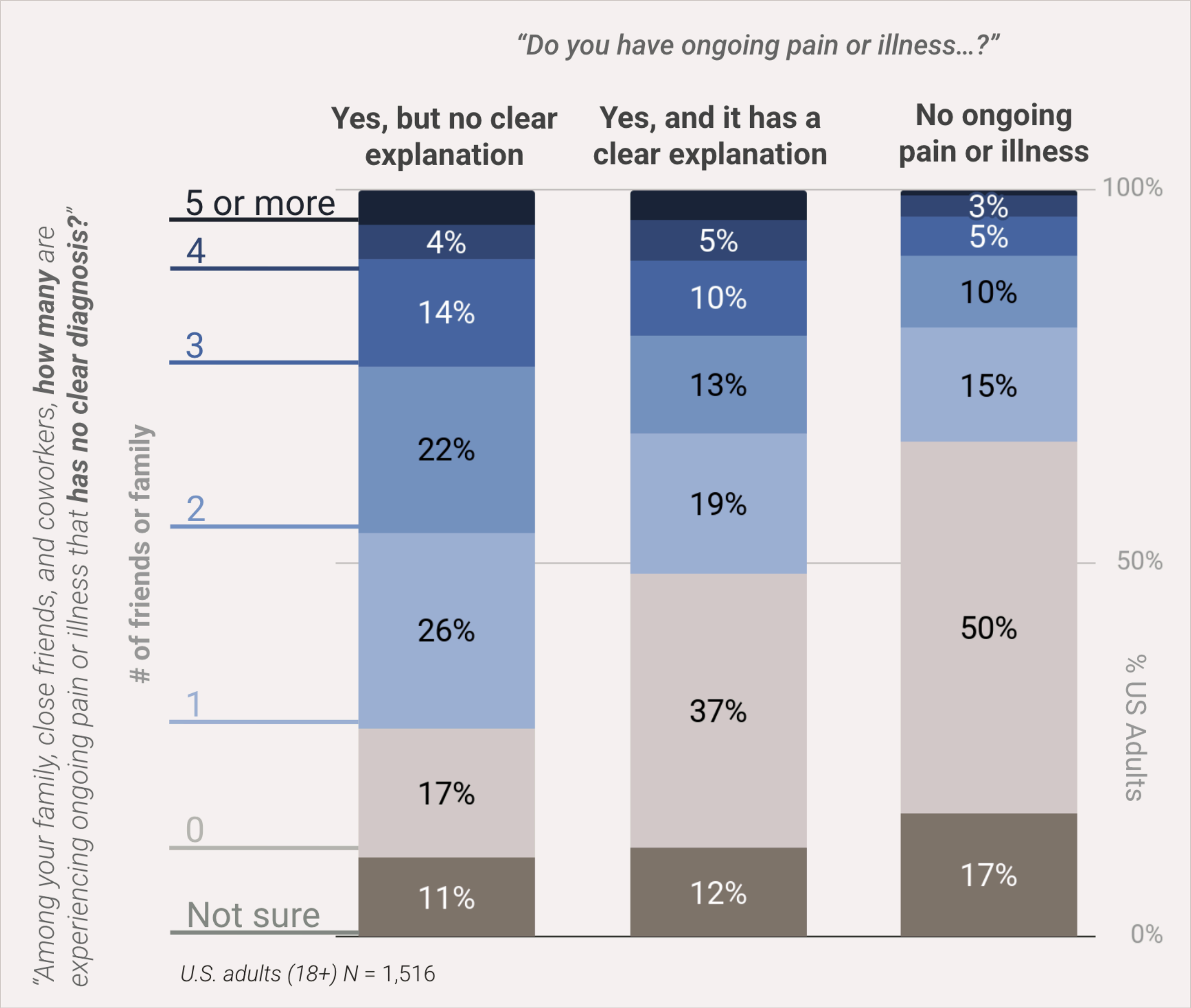
Our survey also asked respondents to indicate how many people among their close friends or family have ongoing pain or illness *with no clear diagnosis*. In Figure 3 (next page) the data show that about half of American adults (51%) have at least one person like this in their close network, while about 32% have two or more. This means that unexplained pain or illness tends to manifest in a social clustering pattern. In particular, the likelihood of having a close personal relationship with at least one person with unexplained pain or illness is more than twice as high when a person *themselves* has unexplained pain or illness, compared to people who do not have ongoing pain or illness at all (Figure 3).

There are multiple potential causes of this clustering pattern. That is, it could be driven by similarity in traits like demographics (e.g., age, region, income) or lifestyles (e.g., stress, diet, exercise) such that some traits are more associated with unexplained pain or illness, and people tend share many of these traits with others in their network. An example of this is people who have endured adverse childhood experiences (ACEs), which is a common risk factor for neuroplastic symptoms, may be more likely to be closely connected to others who have also endured ACEs—such as siblings or parents.

This same phenomenon could happen in a more subtle manner simply by socio-economic clustering, such as if people experiencing the stress of poverty tend to have a network containing mostly others in similar situations. Another possible mechanism is that when people have unexplained pain or illness, they often discuss these situations with their friends and family. Through conversational exchange, people may be more likely to hear about the health challenges of others when they have their own to share. All of these are valuable opportunities for future research.

Given the high prevalence of neuroplastic symptoms in people's close social networks and the fact that social network members are strong influences on one another in their adoption of health behaviors,[39,40] these findings reveal an opportunity for public communication campaigns to educate and inspire people to try neuroplastic recovery therapies.

Figure 3: People with unexplained conditions are most likely to know others who are also in the same situation.



Our study also examined Americans' perceptions of the effectiveness of psychological treatments for ongoing pain or illness. To assess this, we first provided our respondents with a brief summary of what psychological treatments would entail (see the Extended Methods

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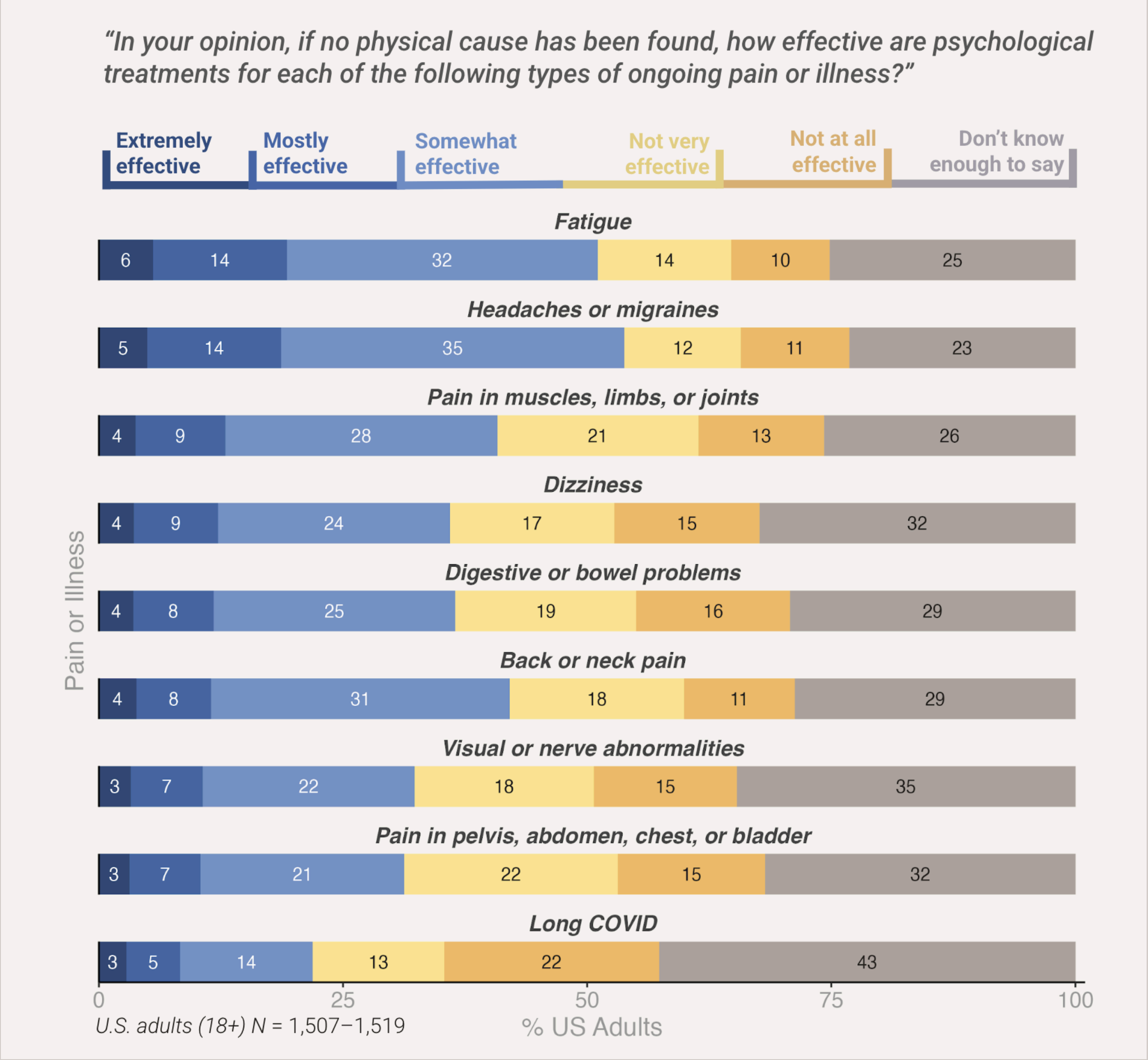
[39] Christakis, N. A., & Fowler, J. H. (2008). The Collective Dynamics of Smoking in a Large Social Network. *New England Journal of Medicine, 358*(21), 2249–2258. DOI: 10.1056/NEJMsa0706154
[40] Christakis, N. A., & Fowler, J. H. (2013). Social contagion theory: Examining dynamic social networks and human behavior. *Statistics in Medicine, 32*(4), 556–577. DOI: 10.1002/sim.5408

section for the full text). Then we asked people to rate how effective they think such treatments would be for each of several types of pain or illness.

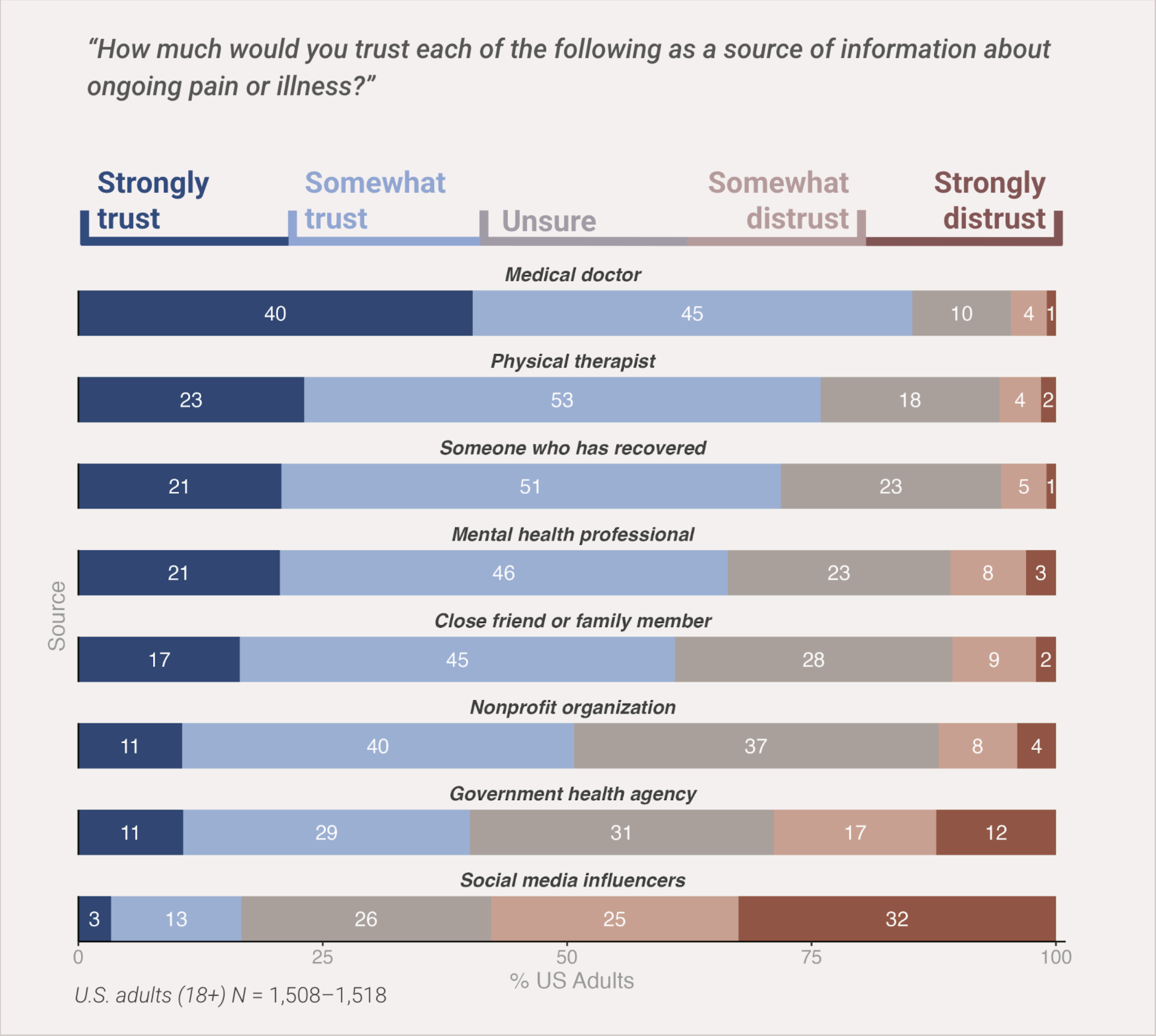
As shown in Figure 4, the only two types of symptoms for which a majority of Americans say psychological treatments would be at least "somewhat" effective are headaches (54%) and fatigue (52%)—perhaps due to a perceived close relationship to the brain. Even for these, though, only about 1 in 5 say such treatments would be "mostly" or "extremely" effective.

Figure 4: Few think psychological treatments would be highly effective.



However, an important finding here is that one of the most common responses to these questions is simply “Don’t know enough to say.” This shows that even though it is rare for people to perceive strong efficacy, *this does not mean people are convinced of inefficacy*. Often, it simply means people lack information upon which to make a judgment either way. This is a consistent pattern throughout the findings of this study, where the primary barrier to progress seems to be more about a lack of awareness than direct resistance.

Figure 5: Healthcare professionals and recovered patients are the most trusted sources of information.



“How much would you trust each of the following as a source of information about ongoing pain or illness?”

U.S. adults (18+) N = 1,508–1,518

When conducting social science research to aid progress on issues where there is a strong need for public awareness, public education, and correction of misconceptions, it is imperative to study who and what people trust for information. Identifying the most trusted (and least trusted) information sources can help guide the strategies for action. Therefore, in our national study, we asked respondents to rate how much they trust or distrust each of several entities as a source of information about ongoing pain or illness.

Our findings show that the most trusted sources tend to be medical professionals (Figure 5, prior page). In particular, nearly all Americans trust medical doctors on this issue (with 40% saying they “strongly trust”), about three in four trust physical therapists (23% “strongly trust”), and about two in three trust mental health professionals (21% “strongly trust”). For each of these, most of the remainder are simply “unsure,” as very few Americans—about one in ten Americans or less—actually distrust each of these entities on this topic. Overall, this provides clear evidence supporting the tactic of relying on medical professionals to be the source through which information about neuroplastic symptoms is shared.

Another important finding here is that one of the most trusted *s*ources of information is people who have recovered from their own ongoing pain or illness. With 72% of Americans trusting them as a source of information and only 6% distrusting, this is a very promising option for public education and persuasive communication campaigns.

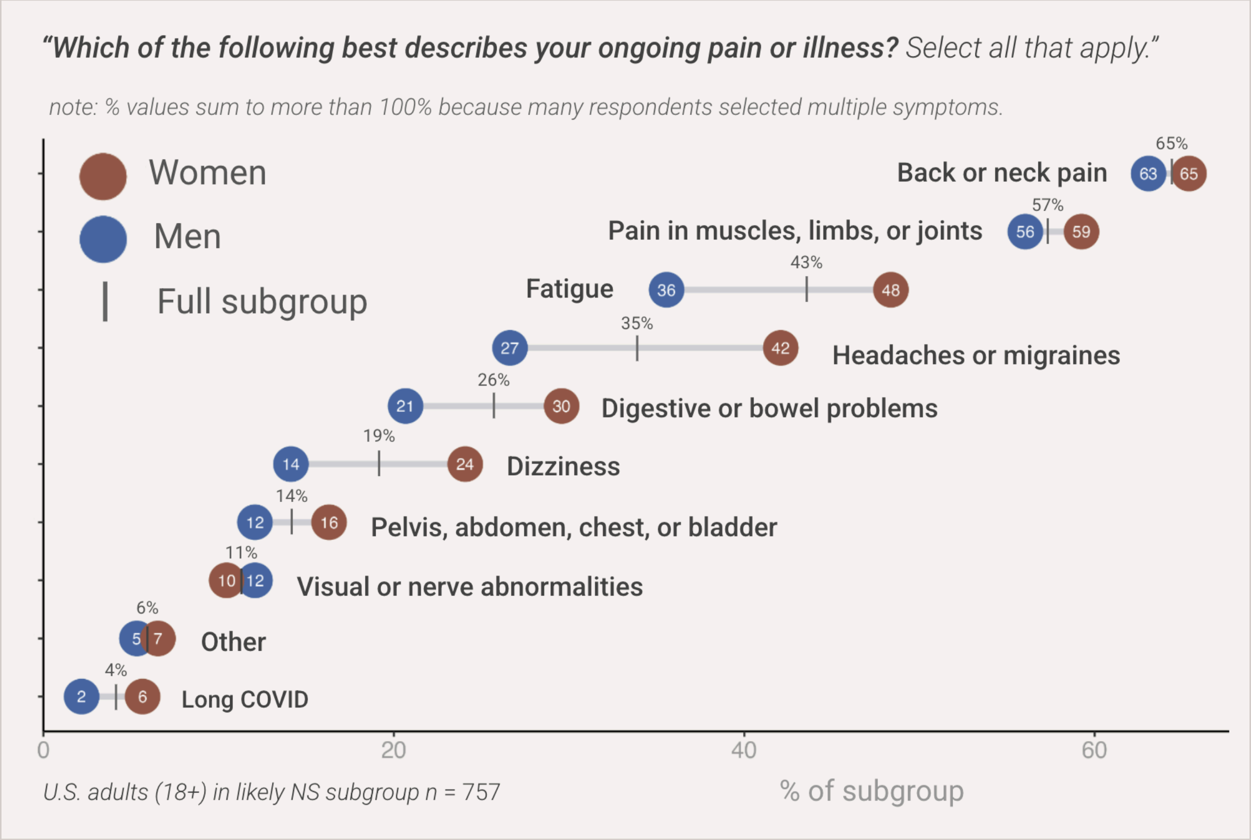
Pain and Illness in the Target Group

For participants in the target subgroup of high likelihood of neuroplastic symptoms, we asked a series of questions about the ongoing pain or illness they are experiencing. In these initial questions, participants described the locations or types of pain or illness and also specified what they think the most likely cause is.

As shown in Figure 6 (next page), the most common reported symptoms are pain in the back or neck (65% of the target group) and pain in muscles, limbs, or joints (57%). However, a large portion (43%) also report chronic fatigue and about one in three (35%) reported having headaches or migraines.

It is unknown how common it is for each of these conditions to be neuroplastic, as there is a lack of research specifically investigating that question. An interesting exception is a study of over 200 people with spine pain that found it was due to a neuroplastic cause in 88% of the sample.[6] If it is true that a vast majority of ongoing neck or back pain is neuroplastic, then we can consider the findings of the present study as supporting evidence because our data presents a similar finding from the inverse orientation: among those who are most likely to have a neuroplastic condition, back and neck pain is particularly common.

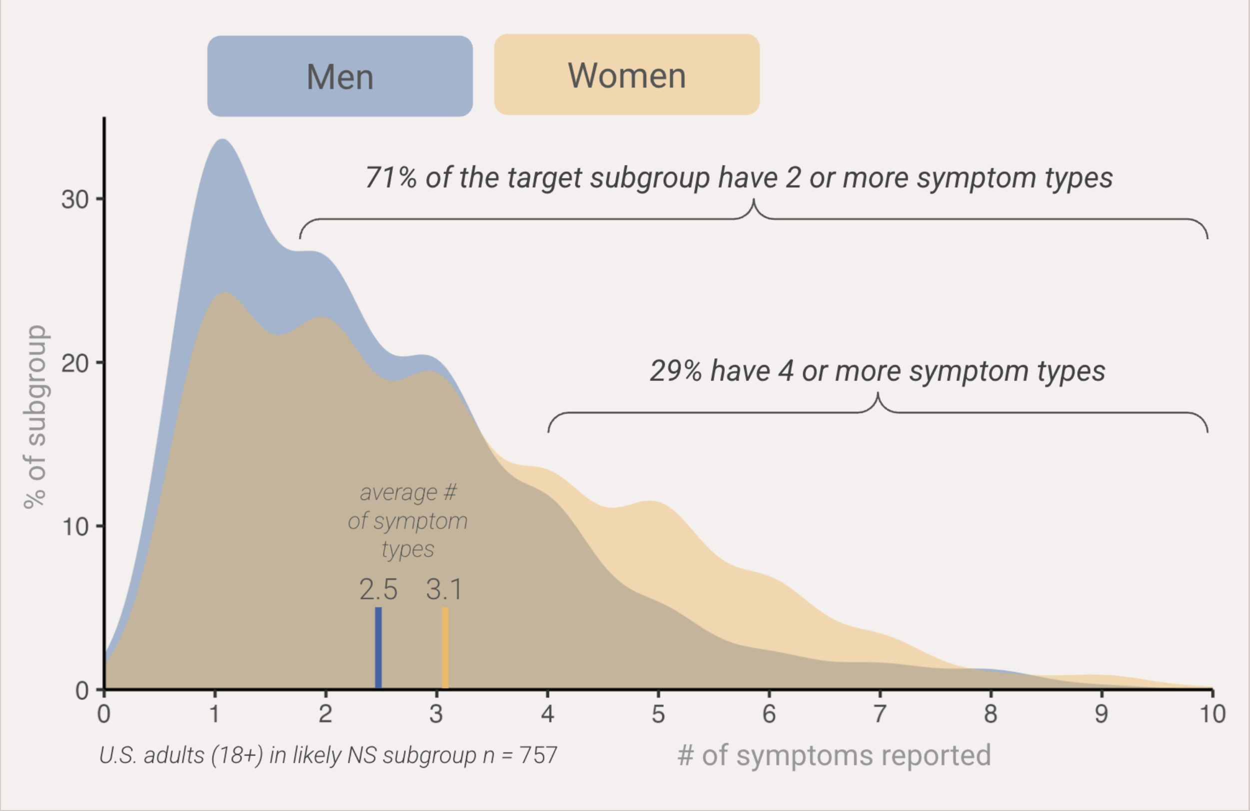
Figure 6: A majority of the target subgroup has pain in back, neck, muscles, limbs, or joints.



Our data (Figure 6) also show intriguing gender differences in the frequency of some symptoms. Within the target subgroup, women are far more likely than men to suffer from fatigue (by 12 points), headaches or migraines (by 15 points), digestive or bowel problems (by 9 points), and dizziness (by 10 points). Across the remaining symptom types, there are none that are substantially more common in men than in women (i.e., a difference greater than the margin of error). Future research should investigate both whether these gender differences also occur among people who are *not* likely to have psychological causes (e.g., those who have a clear explanation and are responsive to treatment). If gender differences occur only or primarily in neuroplastic conditions, this would deserve further investigation.

When describing their symptoms, our survey participants were able to select multiple symptom types, which is why the values in the chart above sum to more than 100% for each group. Selecting multiple symptom types was very common, with an average of 2.8 selections. Our data shows that while 29% of the target subgroup reported only one symptom type, another 41% reported two or three types, and the remaining 29% reported four or more symptom types. Figure 7 below is a density plot, where the horizontal axis represents the number of symptoms chosen by respondents, and the vertical axis represents how many respondents are in each of those segments. The figure shows the number of symptoms reported by men and by women, showing that women are more likely to be experiencing multiple symptoms than men are.

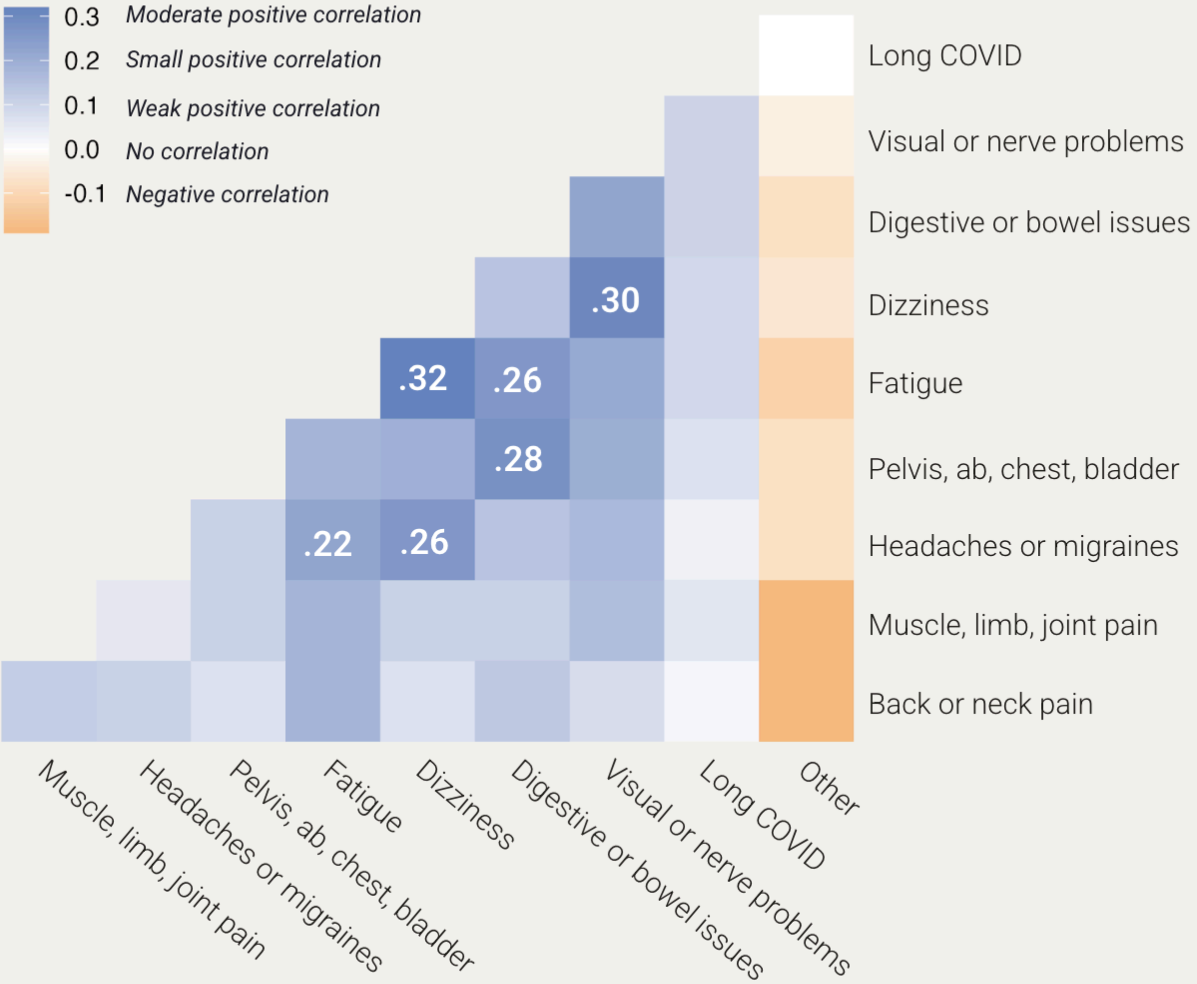
Figure 7: In the target subgroup, most have multiple symptom types.



U.S. adults (18+) in likely NS subgroup n = 757

An important consideration when interpreting Figure 7 is that the number of symptoms is determined by our classification of the types. If we had chosen more fine-grained categories (e.g., separating back pain from neck pain), then there would be a higher average number of symptoms. Therefore, it is best to interpret Figure 7 above as being about the number of distinct *categories or types* of symptoms. In our view, this in fact makes the density plot even more compelling. That is, the results are not simply showing us that most people in the target subgroup have multiple symptoms. Rather, they show that *most (71%) have clusters of symptoms that span multiple distinct categories.*

Figure 8: Some symptoms tend to co-occur.



U.S. adults (18+) in likely NS subgroup n = 757

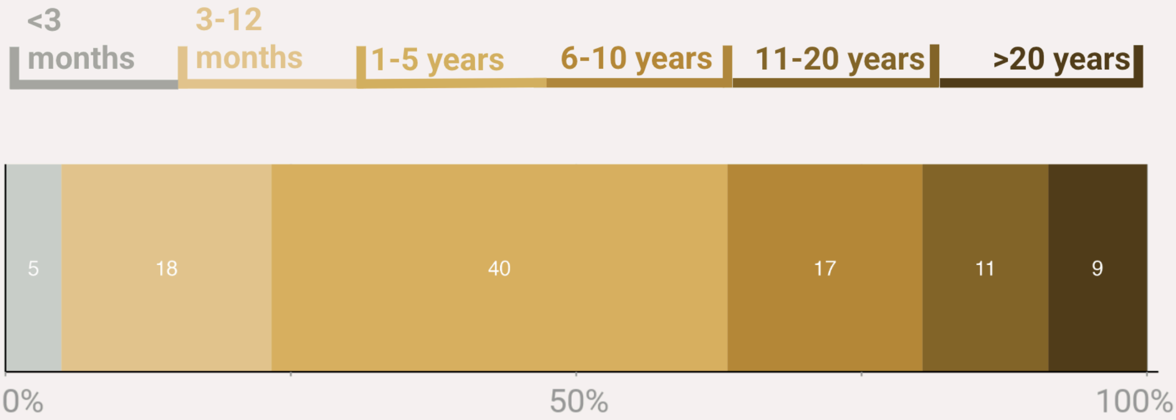
Neuroplastic symptoms result from changes in how the brain processes signals, and these signals can originate from many places in the body. This wide range of potential signal locations might account for the tendency for people to have multiple types of symptoms simultaneously. In fact, co-occurrence across disparate symptom types (e.g., dizziness with pelvis, abdomen, chest, or bladder issues) can often be evidence of neuroplasticity.[2]

Given the prevalence of cases where people have multiple types of symptoms, a natural next question is about which types tend to co-occur. To shed light on this, we calculated bivariate correlations between each combination of symptom types. In Figure 8 (prior page), the heat map shows the strength of the relationships between each symptom type, with larger positive values (e.g., 0.3) representing higher likelihood of co-occurrence within a person. The data show that fatigue and dizziness are the symptoms that have notable positive correlations with the greatest number of other symptoms. One potential reason for the common associations with fatigue is that it can be a downstream effect of living with these other symptoms. For example, people who experience frequent headaches or migraines may then be chronically fatigued as a result.

People's experiences with these symptoms span a wide range of timelines. When asked to estimate how long they have been experiencing their current symptoms, a majority of the subgroup said less than five years, while 37% said more than five years (Figure 9). For interpreting these results, however, it is important to note that this question asked about the symptoms they have been experiencing recently ("within the past year"). So it is likely that if this were expanded to *any* chronic pain or illness ever experienced in the past, then the distribution would shift toward more people reporting a longer history of symptoms.

Figure 9: About 1 in 3 in the target group have had their symptoms for more than 5 years.

"Thinking of the symptoms you have been experiencing recently (within the past year), how long ago did those symptoms begin?"

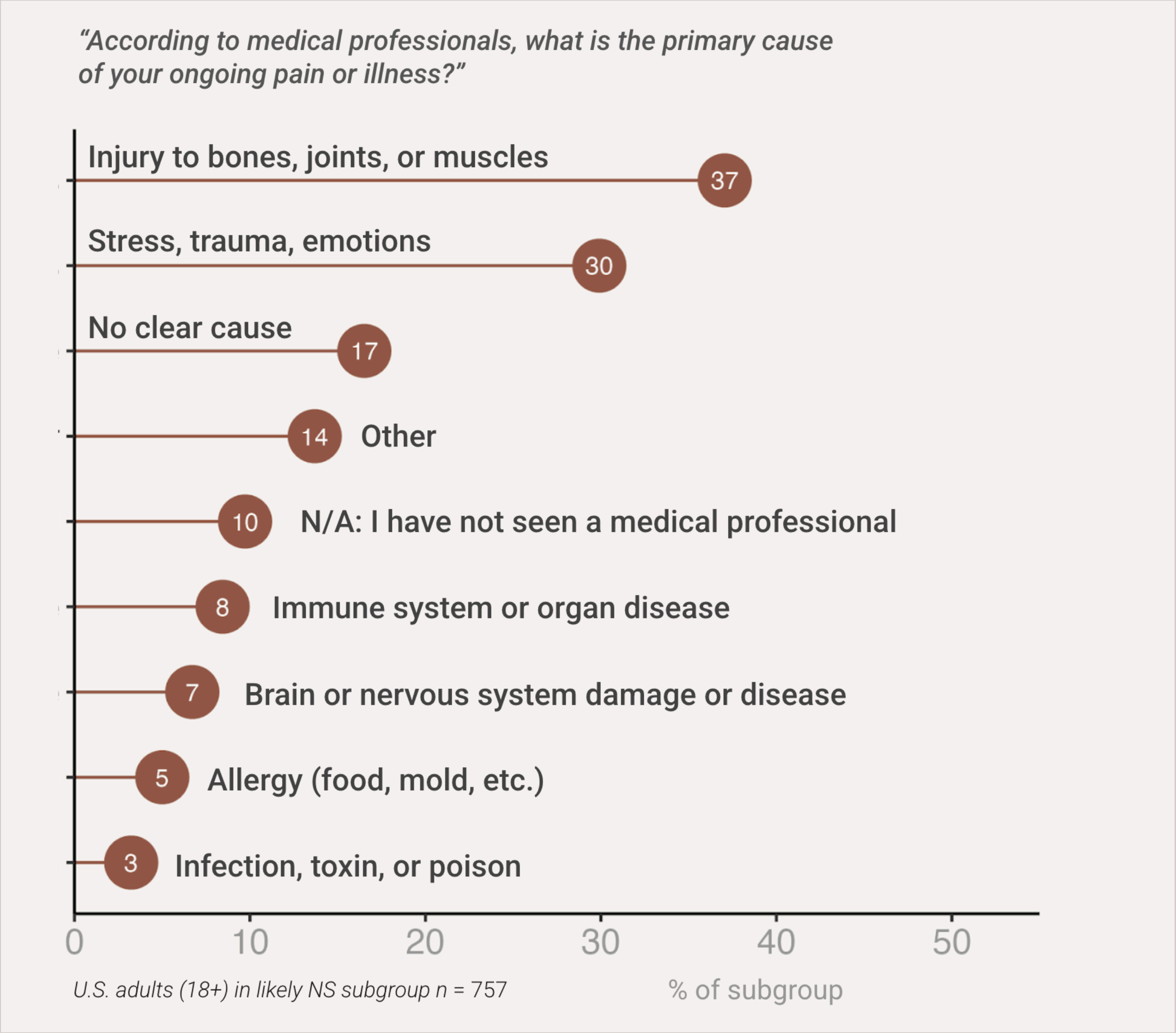


U.S. adults (18+) in likely NS subgroup n = 757

% of subgroup

Many people with ongoing pain or illness have been given a diagnosis based (correctly or incorrectly) on an abnormal organ or structure, or a label based on the pattern of their symptoms (migraine, irritable bowel, and fibromyalgia are examples) or some other explanation. It is important to study the *diagnoses* that are most common in our target subgroup, how often the primary cause is identified as psychological, and how often people have no clear diagnosis.

Figure 10: Most in this target subgroup lack a physical diagnosis.



When asked to choose one primary diagnosis for the cause of their ongoing pain or illness, the most common was injury to bones, joints, or muscles (37%). However, as shown in

Figure 10 (prior page), nearly one in three (30%) chose psychological factors ("stress, trauma, emotions, or life challenges") and many others chose either "No clear cause" (17%) or "I have not seen a medical professional" (10%). When combining these three responses, the data show that *more than half (57%) of the target subgroup lacks a diagnosis that points to a clear physical cause* of their ongoing pain or illness.

An important point to keep in mind when interpreting these results is that this is just within the target subgroup, rather than American adults overall. So, part of the reason that diagnoses like "No clear cause," "Other," and even "Stress, trauma, emotions" are so common in the figure above is that this is data only from those people who already are most likely to have neuroplastic symptoms.

Pathways to Progress in the Target Group

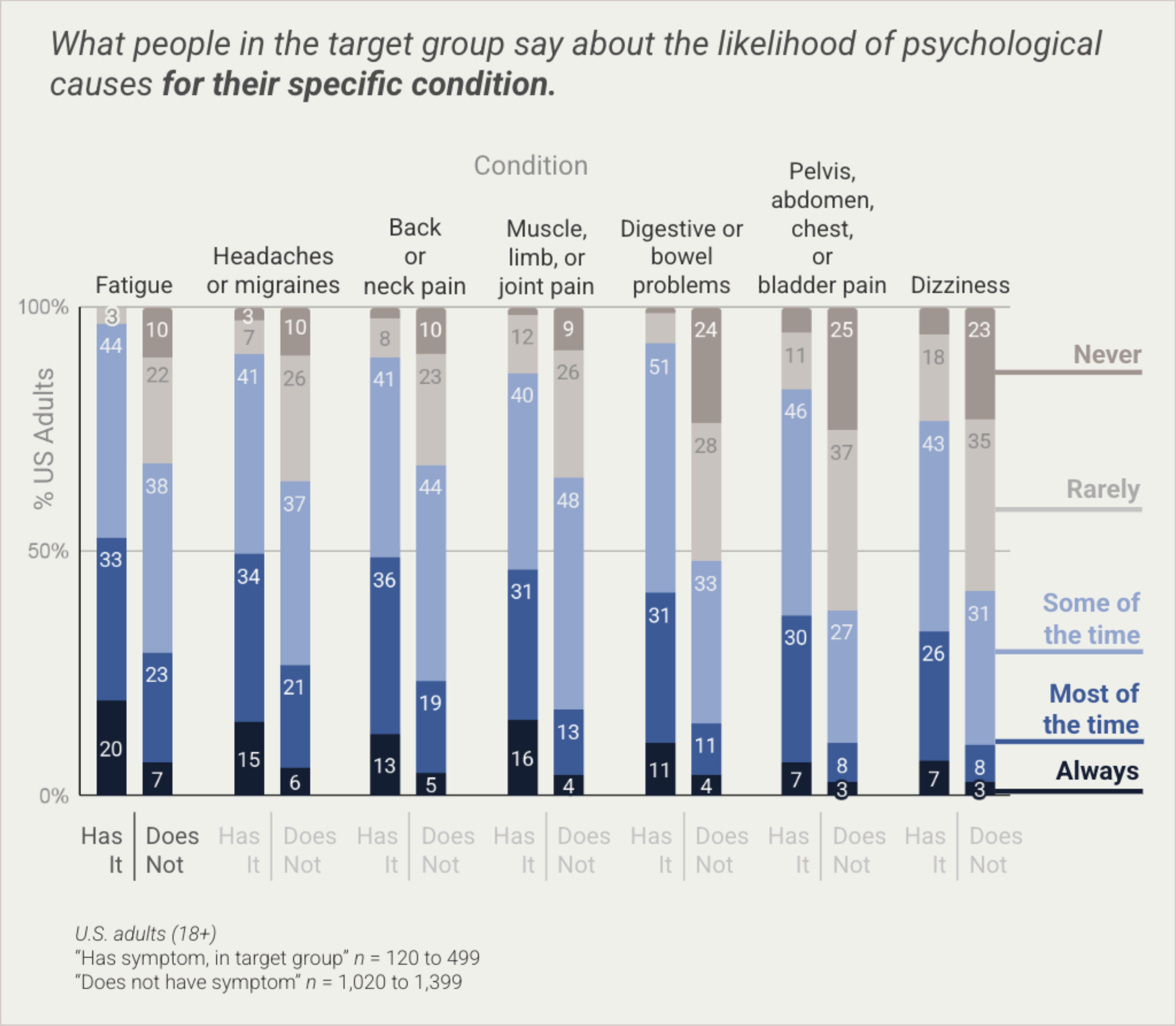
Our study places significant focus on the target subgroup because this is the key portion of the population that we are trying to reach and persuade. It is specifically for *this* group of people that we need to raise awareness, improve education, correct misperceptions, and reduce barriers to action. Because of this, a primary goal of our study is to produce strategic insights that can help advocates and practitioners find pathways to further progress.

A crucial point on any person's pathway to receiving successful neuroplastic treatments is simply the recognition that their own symptoms may be neuroplastic. While our results within the full sample of U.S. adults (p. 13 above) shed some light on this by showing how Americans overall perceive the frequency of neuroplastic symptoms, this is not quite the same as the people's perceptions regarding *their own* symptoms. It is still necessary to study what people with the highest likelihood of neuroplastic symptoms (the target subgroup) think about how often psychological causes are responsible for *the same symptoms that they themselves have*. This would provide highly practical, applicable insights because it mirrors the reality in which people make decisions about seeking neuroplastic treatments. That is, it is people with unexplained or unresponsive symptoms considering how likely it is that their specific symptoms could have psychological causes.

To explore this, we created—for each symptom category—two subgroups of people. *First*, those who both have that type of symptom and are in the target subgroup, and *second*, those who do not have that symptom. This helps us compare a specific target audience for a particular symptom (has it and is likely neuroplastic) against a comparison group for whom the symptom is not relevant (they do not have it).

Figure 11 shows each of these pairs as the columns, clustered together for each symptom type. The vertical axis shows people's perceptions of the likelihood of psychological causes for each specific symptom. Put together, the figure shows how these perceptions of the likelihood of psychological causes *differ depending on whether people either 1) have that type of symptom themselves and are in the likely neuroplastic group, versus 2) do not have that symptom.*

Figure 11: People say psychological causes are more likely when they themselves have that symptom and are in the target subgroup.



What people in the target group say about the likelihood of psychological causes ***for their specific condition.***

U.S. adults (18+)
"Has symptom, in target group" *n* = 120 to 499
"Does not have symptom" *n* = 1,020 to 1,399

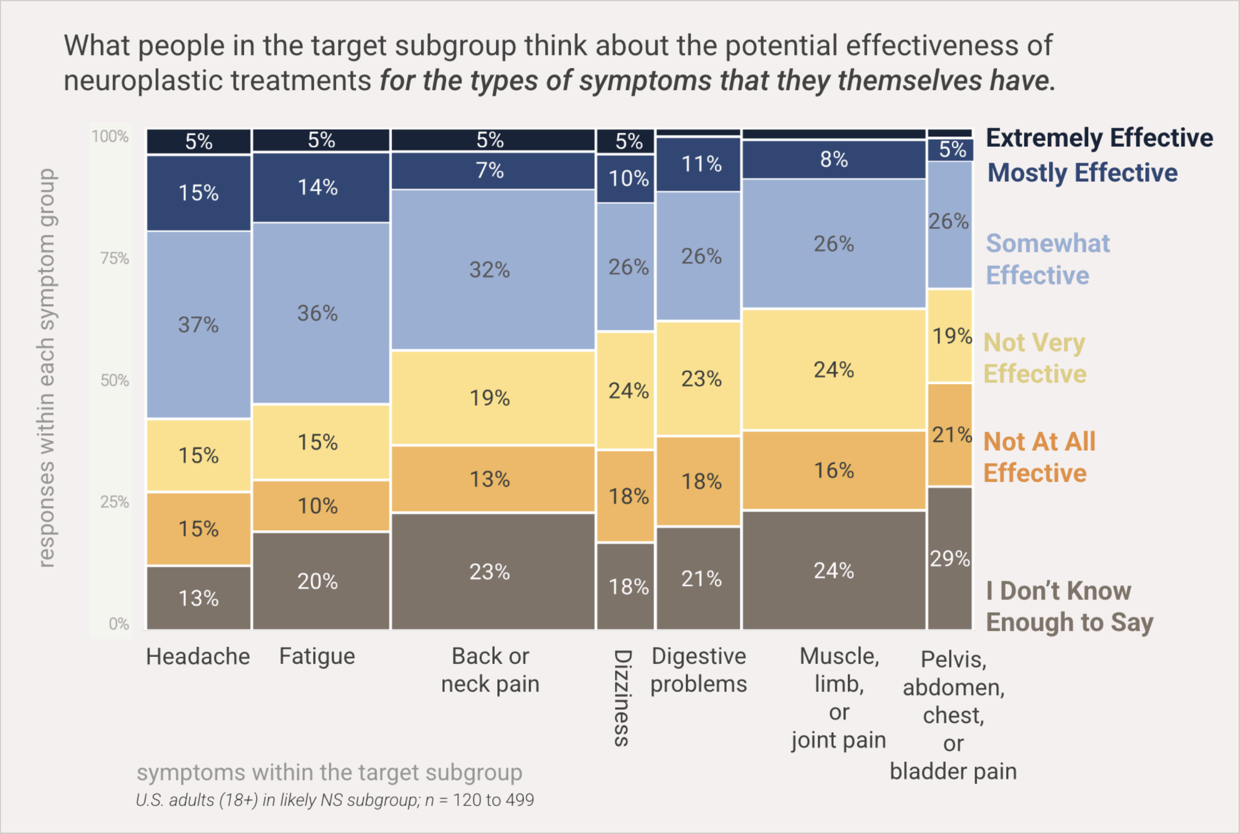
The results in Figure 11 clearly show that people rate psychological causes as far more likely when they themselves have that symptom and are in the target subgroup compared to when they do not have that symptom. For example, nearly all (93%) of people who themselves have digestive or bowel problems that are unexplained or treatment resistant (left side of the pair) say it is at least "Some of the time" caused by psychological factors, and an extraordinary 42% say at least "Most of the time." In contrast, those who do not have digestive or bowel problems think psychological causes are far less likely, with fewer than half (48%) saying at least "Some of the time" and only 15% saying at least "Most of the time."

This same pattern—to varying degrees—is seen across every category of symptoms. People who have ongoing pain or illness that is unexplained or treatment resistant (i.e., they are in the target subgroup of high likelihood of neuroplastic symptoms) tend to be *very aware* of the possibility that the symptoms they have may be caused by psychological factors. This differs substantially from the results of the overall national level analysis on page 13 because those initial analyses grouped the entire national sample together.

Overall, this suggests a promising situation in which, when seeking to raise awareness and motivate action among the target population that actually needs the treatment, we can expect to find that most of them are open to these ideas as they may have already been suspecting them as a possibility.

In the same way, we can see the perceived effectiveness of neuroplastic treatments specifically among people who have that particular symptom and are in the target subgroup (due to it being unexplained or treatment resistant). Figure 12 (next page) shows these results through a Marimekko chart. This style of chart has columns of different widths that correspond to the size of that group. So, for instance, the "Back or neck pain" column is much wider than the "Dizziness" column because the former is far more common as a type of symptom in the target subgroup. The vertical axis is color-coded to represent the perceived effectiveness of neuroplastic treatments among that specific cluster of people (those unexplained or treatment resistant symptoms of that particular type). In sum, this analysis shows us how people in the target subgroup think about the potential *effectiveness* of neuroplastic treatments *for the types of symptoms that they themselves have.*

Figure 12: Symptom groups differ on perceived treatment effectiveness.



What people in the target subgroup think about the potential effectiveness of neuroplastic treatments *for the types of symptoms that they themselves have.*

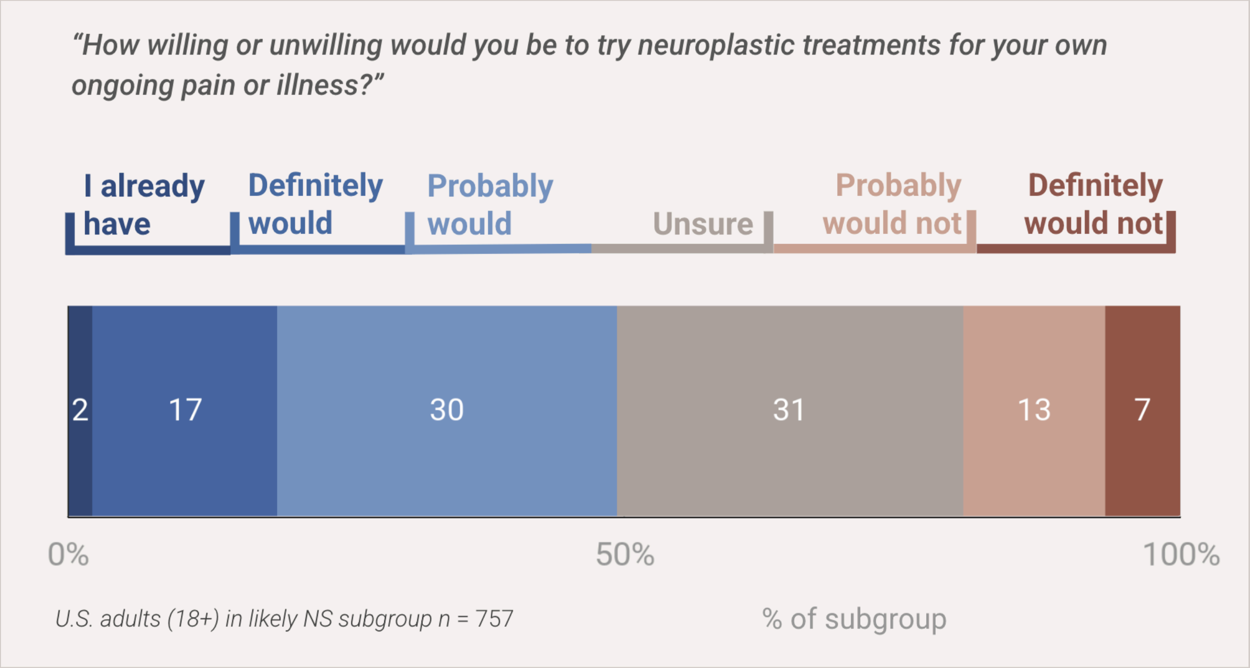
U.S. adults (18+) in likely NS subgroup; n = 120 to 499

The results (Figure 12) show that the symptom groups who see most promise in neuroplastic treatments are those who suffer from headaches or fatigue. A majority in each of these groups already think neuroplastic treatments for headaches and fatigue (respectively) would be at least "somewhat effective." Fewer say either "not very effective" or "not at all effective." In contrast, perceived effectiveness of neuroplastic treatments for muscle, limb, or joint pain as well as pelvis, abdomen, chest, or bladder pain is relatively low among people who have those very symptoms.

These perceptions of the effectiveness of neuroplastic treatments are notably lower than perceptions that symptoms may be caused by psychological causes (as shown earlier in Figure 11). In fact, there is a large and consistent gap between awareness of causes and perceived effectiveness of treatments. Our analyses show that majority of the target subgroup (58%) satisfies all three of these criteria: 1) they have a specific symptom type, 2) they believe that symptom type is at least "Sometimes" has psychological causes, *while also* 3) believing that psychological treatments are *less than* "Somewhat" effective for that symptom type. This state—being aware of potential psychological causes of one's symptoms but not believing psychological treatments to be effective for it—is more common among those who have muscle, limb, or joint pain (53%) and pelvis, abdomen, chest, or bladder pain (55%) compared to those with headaches (35%) or dizziness (38%).

Overall, this suggests that people differ in their baseline perceptions of how effective neuroplastic treatments would be in helping them personally, depending on which type of symptom they have. As advocates and practitioners seek to build public awareness and encourage people to consider trying neuroplastic treatments, these data show that people suffering from chronic fatigue or headaches may be a promising place to begin. As these favorable initial audiences begin to experience successful results, the spread of their recovery stories may create a social contagion effect that can create positive change in the effectiveness perceptions among the other symptom groups.

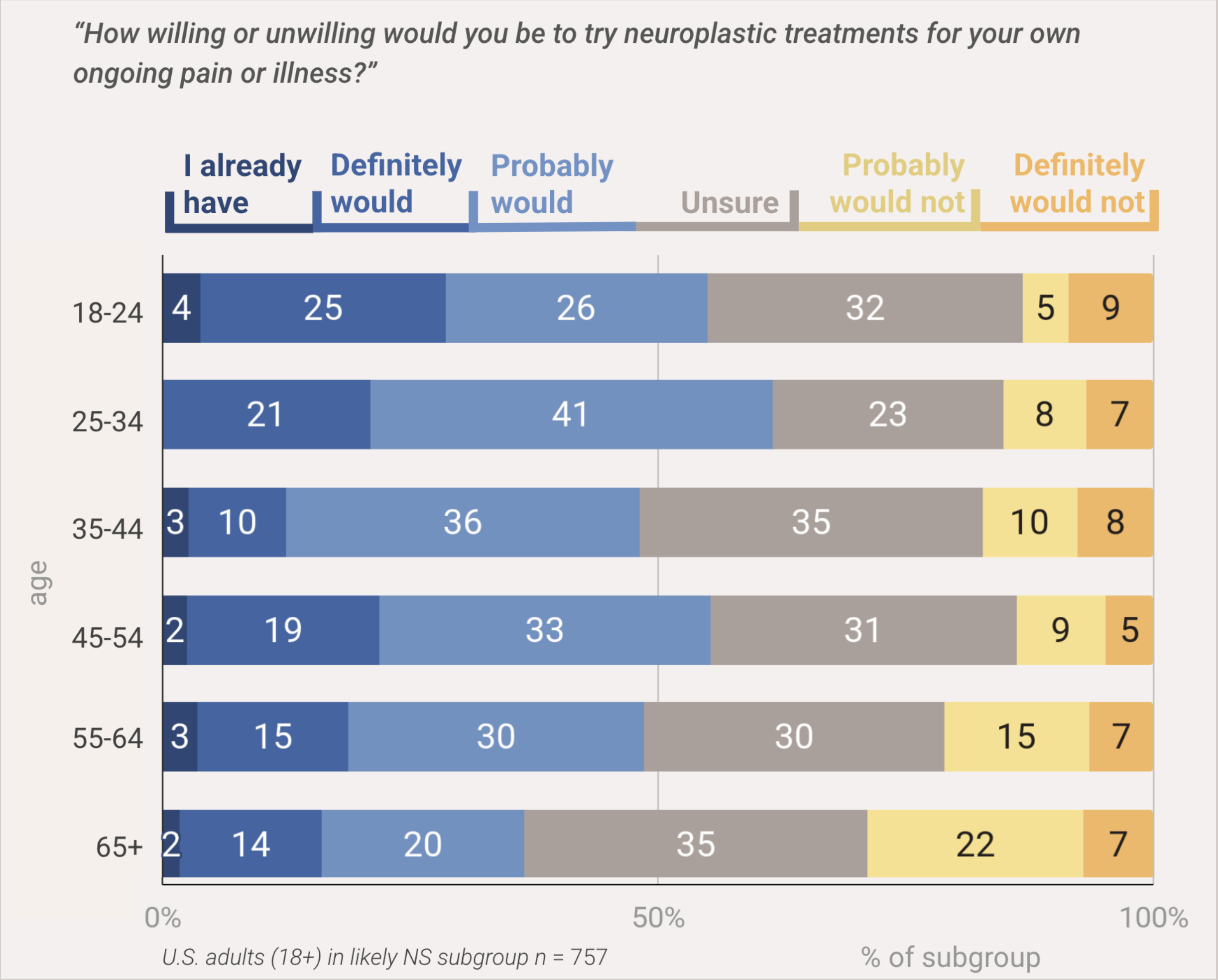
Figure 13: About half of the target subgroup is already willing to try neuroplastic treatments.



That being said, one of the most encouraging findings from this study is that within the target subgroup nearly half (47%) say they are *willing to try* neuroplastic treatments (either "definitely would" or "probably would") and, in contrast, only 20% say they probably or definitely would not (Figure 13). This is further evidence that the primary challenge is not one of persuasion or defeating opposition. Rather, because so many people are receptive to these ideas, the primary challenge is increasing awareness and streamlining paths to access.

It is important, though, to consider that willingness to try neuroplastic treatments differs across demographics. One of the most consistent patterns we observed in our data is the variations by age. For example, older members of the target subgroup tend to be less willing to try neuroplastic treatments (Figure 14). Among those who are ages 25-34, nearly two in three are already willing to try neuroplastic treatments. But this drops to only 36% among those over age 65. There are several possible reasons for this. One could be that this is tied to self-efficacy—that is, people's perceptions of their own ability to do something—such that many older people do not feel confident in their ability to obtain these treatments.

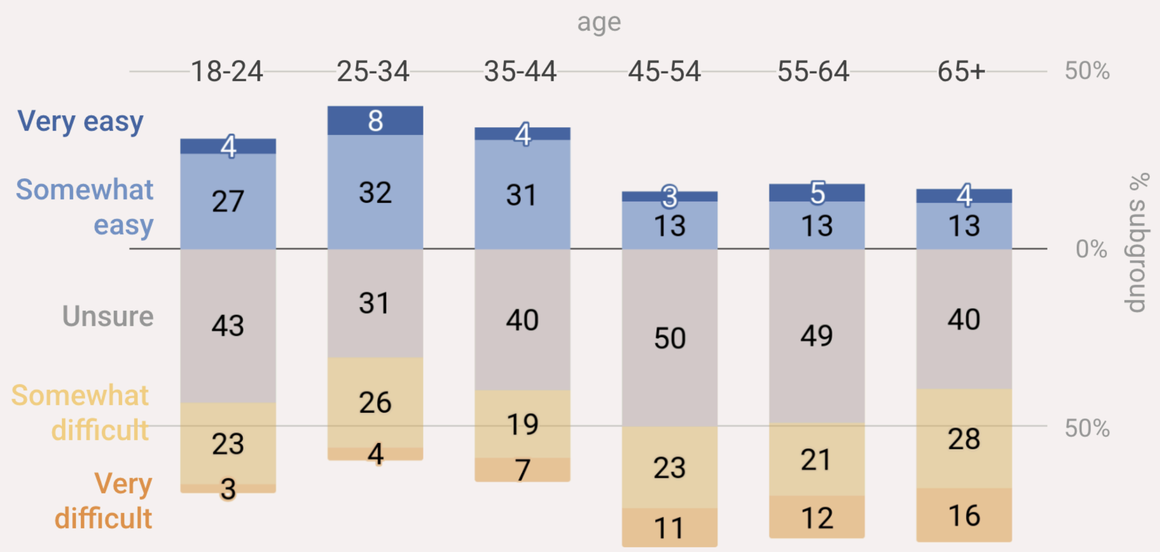
Figure 14: Willingness to try neuroplastic treatments is lowest among those 65 and over.



To explore this explanation further, we specifically analyzed the differences in self-efficacy perceptions across age groups. As shown in Figure 15, people ages 25-34 in the target subgroup are about *twice as likely* as those 65+ to say that finding resources or practitioners for neuroplastic treatments would be either "very easy" or "somewhat easy." Overall, only 24% of all target subgroup members (and only 17% of subgroup members over age 45) think accessing these treatments would be easy.

Figure 15: Younger subgroup members feel more capable of accessing neuroplastic treatments.

"If you decided to try neuroplastic treatments, how easy or difficult do you think it would be for you to find resources or practitioners that provide these therapies?"



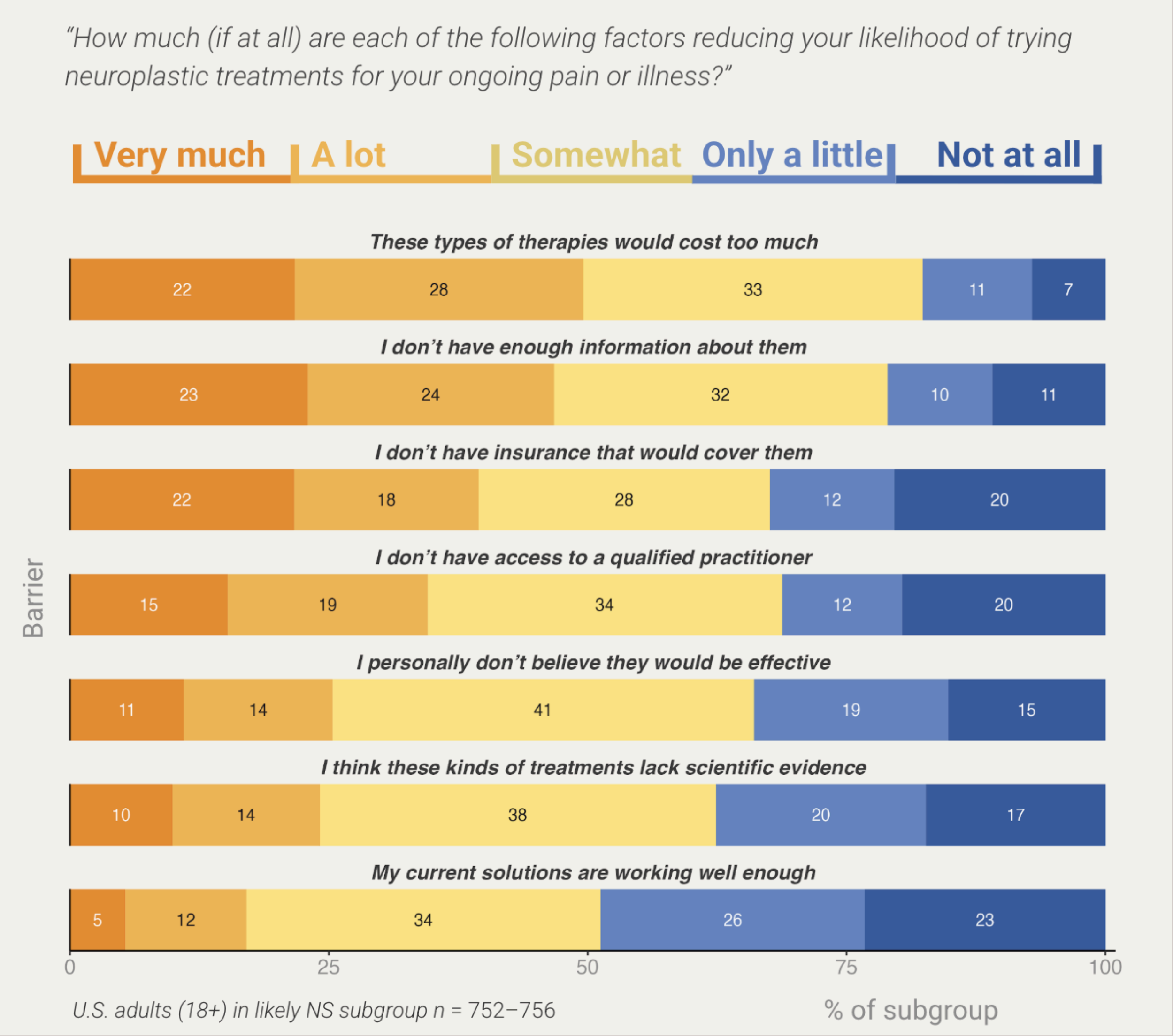
U.S. adults (18+) in likely NS subgroup n = 757

It is interesting to keep in mind how this interacts with our prior findings about strong receptivity to the idea of neuroplastic symptoms and strong willingness to try neuroplastic treatments. Overall, these findings paint a picture of the dominant mindset in the target subgroup such that there are generally favorable opinions about these ideas but a clear lack of empowerment. That is, people are willing to consider neuroplastic causes but most do not feel like they know how or where to access treatments.

Because of this situation, it is crucial to examine exactly what the primary barriers to action might be. The better we understand these barriers, the better we can mitigate them and streamline the pathway for those who are in need of these solutions.

We asked the target subgroup how much each of several types of barriers were reducing the likelihood that they would try neuroplastic treatments for their own ongoing pain or illness. As shown in Figure 16, two of the top three barriers are about financial aspects. The most influential barrier is the perception that these therapies would cost too much, with 82% of the target subgroup saying this barrier at least "somewhat"reduces the likelihood they would try it, and 50% saying it reduces it "A lot" or "Very much." Similarly, a large majority (68%) feel that a lack of insurance coverage would at least "Somewhat" reduce their likelihood of trying neuroplastic treatments.

Figure 16: Practical and informational barriers are more influential than outright skepticism.



U.S. adults (18+) in likely NS subgroup n = 752–756

In contrast, perceptions of ineffectiveness and lack of scientific evidence are less influential as barriers in the mind of this target subgroup, although they still could be important barriers in many situations. But it is far more common for this group to say that their likelihood of trying neuroplastic treatments is limited by a simple lack of information about them. This, again, bolsters the overall message that within this target subgroup, many people are open to considering neuroplastic symptoms and treatments, and the primary barriers are a lack of awareness, information, and access.

Conclusions and Next Steps

This study provides a deep and detailed look at how the American public thinks about neuroplastic symptoms and their associated treatments. By studying public perception, we are able to generate further progress on this issue by discovering both a) what needs and challenges are most pressing, as well as b) what strategies are most likely to be effective.

As we continue to explore this rich dataset, we will publish additional findings and short reports as an ongoing series on the ATNS website. To receive these future reports and materials, we encourage readers to visit the ATNS site or subscribe for email updates.

Through the initial analyses we have reported here, we come away impressed by three discoveries. **First**, there is a remarkably positive opinion climate regarding NS. In particular, most Americans agree that psychological causes are possible for a few major types of symptoms, and many think psychological treatments could be at least somewhat effective. The remainder are *not* strongly opposed, but rather it is more common for people to simply be unsure or to say they do not have enough information yet. These levels of openness to psychological explanations and treatments are even higher when they refer specifically to symptom types that people are themselves experiencing. Overall, this shows that this issue is not facing a challenge of *persuasion* (in which people need to be convinced to change deeply held beliefs or habits) but instead is simply facing a challenge of *unawareness* (in which people need to be informed of these possible causes and of the availability of solutions). This is a very positive state of affairs, suggesting that public education campaigns can be extraordinarily effective because they do not face the widespread skepticism and ingrained habits that hinder progress in many other public health issues.

Second, we were struck by the prevalence of unexplained ongoing pain or illness among American adults. Even when we deliberately created liberal criteria for inclusion in the target subgroup (with nearly half of the national sample being included), we still find that *a* *majority of this subgroup* does not have a clear physical explanation for their ongoing pain or illness. Nearly one in three (30%) specifically name “stress, trauma, emotions, or life challenges” as the primary cause, and many others say they do not have a clear diagnosis. These findings underscore the pressing need for increased public awareness of NS and increased access to effective psychological treatments.

Third, our findings point to promising avenues for future progress. In particular, we find that medical professionals and everyday people who have made successful recoveries are both widely trusted as sources of information about ongoing pain and illness. This points to a dependable strategy for communication campaigns: showcasing medical experts and personal recovery stories to demonstrate the successful outcomes and credible evidence regarding the effects of neuroplastic treatments. Our data also suggest some key audience groups that might be immediately most open to these ideas—specifically, younger Americans as well as those who suffer from chronic fatigue and headaches.

Going forward, a key next step is to build strong coalitions of support among medical professionals and practitioners, advocates, and the general public. Communication campaigns to raise awareness and inform practitioners can be remarkably effective when the primary barrier is a lack of awareness. While some logistical and financial barriers also remain salient (e.g., insurance coverage, cost of services, training of professionals), much of the progress on the road ahead stems from increasing the level of understanding across stakeholders. Throughout this process of moving the public from awareness to positive intentions to action, it is also crucial to consider the role of perceived self-efficacy. That is, many people may be open to the idea of neuroplastic treatments, but in order to take action they must first be shown clear evidence of a) its successes and b) their own ability to obtain it. These must be core features of communication campaigns going forward.

We at the Association for the Treatment of Neuroplastic Symptoms are committed to our continued work of increasing awareness of NS and access to psychological treatments for the millions who could dramatically benefit from these important solutions.

Extended Methods

Data and Participants

We recruited 2,133 respondents to participate in this survey. After removing respondents for failing one or more attention checks or quality checks, 1,519 responses were retained for our analyses. Participant recruitment took place online from May 28–30, 2025, and the survey was conducted in the Alchemer online survey environment. All respondents were adult (18+) United States residents. To ensure we collected enough responses to have a subsample of respondents who met the criteria for likely having neuroplastic symptoms, we continued data collection until the number of respondents in the subsample surpassed 750. In the final sample, 757 respondents were included in this target group. Inclusion criteria are specified in the next section.

This survey used a nested quota sampling strategy to match U.S. Census proportions of gender, age, income, race, ethnicity, education, and geographic region. Using internal estimates, we also set recruitment quotas for political party affiliation. To further ensure the insights reported from this sample closely reflect the U.S. population, the sample was weighted to match U.S. Census and internal benchmarks. We created weights using *iterative proportional fitting* (or "raking"), bringing the sample closer to our benchmarks for gender, age, education, income, race, and political party. The weights were trimmed to the 0.3–5.0 range to minimize the influence of extreme cases.

Materials and Procedure

The survey had two main sections. The first part of the survey included everyone in the national sample. Then, respondents answered two qualifying questions that determined whether they were part of our subsample of interest. If they met the criteria (described below), they continued to the rest of the survey. All respondents answered all relevant demographic questions at the end of the survey. The full text of all survey questions and the response options are available upon request.

National survey. First, respondents reviewed an informational page that welcomed and thanked them, set basic expectations for the survey, and assured them that their responses would be anonymous.

Next, we briefly introduced the concept of *ongoing pain or illness*: “The next few questions are about **ongoing pain or illness.** By this we mean symptoms that occur on *most days or every day* over many weeks or months.”

Then we measured the extent to which respondents believe that psychological factors could contribute to a variety of symptoms. The question was: “When people have the following types of ongoing pain or illness, how often do you think that psychological factors (stress, trauma, emotions, life challenges) are contributing significantly?” Then respondents answered this question in a matrix-style format for nine different kinds of symptoms (Back or neck pain; Pain in muscles, limbs, or joints; Headaches or migraines; Pain in pelvis, abdomen, chest, or bladder; Fatigue; Dizziness; Digestive or bowel problems; Visual or nerve abnormalities; “Long COVID”), with the response options *Always*, *Most of the time*, *Some of the time*, *Rarely*, and *Never*.

Next, we introduced respondents to the idea of using psychological treatment to treat physical pain: “When treatments for *physical causes* of ongoing pain or illness are unsuccessful, some people seek *psychological treatments* that address stress, trauma, emotions, or life challenges. These treatments seek to help people understand how the brain can cause symptoms in the body by using education, writing, life insights, and brain retraining.” Then respondents answered another set of questions in a matrix. The question was: “In your opinion, if no physical cause has been found, *how effective are psychological treatments* for each of the following types of ongoing pain or illness?” and contained the same nine types of symptoms from the prior block of questions. Response options were *Extremely effective*, *Mostly effective*, *Somewhat effective*, *Not very effective*, *Not at all effective*, and *I don’t know enough to say*.

Then we asked respondents about people they know: “Among your family, close friends, and coworkers, how many are experiencing ongoing pain or illness that…” with two matrix items “has no clear diagnosis” and “is not responding to treatment as the doctor expects” and response options *0*, *1*, *2*, *3*, *4*, *5 or more,* and *Not sure*.

The final set of questions in this part of the survey measured trust in various entities on this topic: “How much would you trust each of the following entities as a source of information about ongoing pain or illness?” We asked about eight different entities, including “A medical doctor,” “A mental health professional,” and “A close friend or family member”, among others. Response options were *Strongly distrust*, *Somewhat distrust*, *Unsure*, *Somewhat trust*, and *Strongly trust*.

Subsample survey. After the trust block, the full sample answered an attention check question, and then two questions that determined whether they qualified for our subsample of interest.

Before the qualifying questions, we defined “ongoing pain or less” more specifically: “Now we’d like to hear about your own personal experiences with ongoing pain or illness—if you have any. Ongoing pain or illness is defined as symptoms that persist for longer than 3 months. For some people, their pain or illness has a clear cause, explanation, and diagnosis. But for other people it does not.” Then respondents were asked “Do you have ongoing pain or illness, and if so, does it have a clear explanation (definite cause or diagnosis)?” (response options: *Yes, and it has a clear explanation*; *Yes, but no clear explanation*; *No, I do not have ongoing pain or illness*). Respondents who reported either of the two “yes” responses were asked a second qualifying question: “How much is your ongoing pain or illness responding to treatment in the way that your healthcare provider expects it should?” with response options *Very much*, *Mostly*, *Somewhat*, *Only a little*, and *Not at all*.

If respondents answered the first question “Yes, but no clear explanation,” they qualified for our subsample (see Figure 1). If respondents answered “Yes, and it has a clear explanation,” we only included them in the subsample if they reported that their ongoing pain or illness is responding to treatment “somewhat,” “only a little”, or “not at all” in the way their healthcare provider expects. Then all respondents completed a second attention check. Respondents who did not qualify for our subsample skipped to the final question block to answer demographic questions. Respondents who qualified for the subsample continued to answer more questions that were tailored to this audience.

We first asked subsample respondents about their symptoms: “Which of the following best describes your ongoing pain or illness? Select all that apply.” Respondents could choose the symptoms that apply to them from the list of nine categories we noted earlier. We also included an “Other (please specify)” option for this question.

After reporting their symptoms, respondents answered one question about the timeline of their symptoms: “”Thinking of the symptoms you have been experiencing recently (within the past year), how long ago did those symptoms begin?” (*Less than 3 months ago*; *3-12 months ago*; *1-5 years ago*; *6-10 years ago*; *11-20 years ago*; *More than 20 years ago*).

To get a better understanding of the *diagnoses* respondents have been given by medical professionals, we asked: "According to medical professionals, what is the primary cause of your ongoing pain or illness? Select all that apply." with six general categories (*A disease of your immune system or organ; Disease or damage of the brain or nervous system*; *Structural injury or damage to bones, joints, or muscles; Stress, trauma, emotions, or life challenges*; *Infection, toxin, or poison*; *Allergy (food, mold, etc.)*). We also included three categories respondents could choose such as *Medical professionals have not been able to identify a clear cause*; *Other*; and *N/A: I've not seen a medical professional*.

In the next part of the survey, we introduced respondents to the idea of neuroplastic symptoms and treatment: "Pain or illness that is influenced by psychological factors like stress, trauma, emotions, or life challenges is referred to as 'neuroplastic.' Neuroplastic treatment uses education, brain retraining, life insights, and writing exercises to treat ongoing pain or illness." Then we asked respondents about their willingness to try neuroplastic treatments: "How willing or unwilling would you be to try neuroplastic treatments for your own ongoing pain or illness?" with six response options (*I have already used neuroplastic treatments*, *Definitely would*, *Probably would*, *Unsure*, *Probably would not*, *Definitely would not*).

Because of its importance in guiding behavior, we asked about self-efficacy with regard to finding neuroplastic treatments: "If you decided to try neuroplastic treatments, how easy or difficult do you think it would be for you to find resources or practitioners that provide these therapies?" which had five response options (*Very easy*; *Somewhat easy*; *Unsure*; *Somewhat difficult*; *Very difficult*).

Lastly, we asked about perceived barriers to trying neuroplastic treatments: "How much (if at all) are each of the following factors reducing your likelihood of trying neuroplastic treatments for your ongoing pain or illness?". The matrix block contained seven different barriers (*I don't have enough information about them*; *These types of therapies would cost too much*; *I don't have insurance that would cover them*; *I don't have access to a qualified practitioner*; *I think these kinds of treatments lack scientific evidence*; *I personally don't believe they would be effective*; *My current solutions are working well enough*), and each had the same five response options (*Very much*; *A lot*; *Somewhat*; *Only a little*; *Not at all*). After this last section, respondents answered demographic questions then completed the survey.